Financial incentives for health-behaviour change assessing behavioural and cognitive consequences

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Financial incentives for health-behaviour change: assessing behavioural and cognitive consequences

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In loving memory of my brother Jason (1971-2002)

"You are with me every step of the way…"

Abstract

Offering individuals financial incentives for changing their health-related behaviour is one possible strategy for improving health and reducing morbidity and premature mortality. However, several important aspects of the behavioural and cognitive consequences of this type of intervention remain unclear. First, there is uncertainty regarding the effectiveness of financial incentives in achieving sustained changes in repeated health behaviours, as well as of the factors that might modify any effects. Second, the variables that might confound the impact of incentives on health-related behaviours remain unexplored. Third, the speculated unintended consequences of financial incentives on cognitive processes, including information processing and decision-making, have yet to be examined systematically. This thesis addresses these uncertainties.

Study 1 is a systematic review and meta-analysis aiming to estimate the effectiveness of financial incentives in achieving sustained change across repeated health-behaviours (smoking cessation, healthier eating, including reduced alcohol consumption and increased physical activity) and to examine the factors that modify any impacts. Findings indicate that although financial incentives changed repeated health-behaviours, their role in reducing non-communicable disease burden is potentially limited, given effects were not sustained beyond three months after incentive removal. Results also highlight the role of recipients' deprivation level in modifying incentive impacts on behaviour overall, as well as that of incentive value in modifying impacts on smoking cessation.

Study 2 is a qualitative study exploring the variables that might confound the impact of financial incentives on health-related behaviours. The study describes and compares the stop-smoking experiences of pregnant smokers' who were incentivised for smoking cessation with those of women who were not. Results highlight the need to be cautious about attributing the effects of financial-incentive schemes to incentives *per se*. Given that incentive schemes are complex behavioural interventions, their impacts could derive from indirect influences, mediated by changes to some aspects of the process involved in their delivery, including the provision of increased support.

Study 3 is a randomised controlled trial aiming to estimate further the effectiveness of financial incentives in changing health-related behaviours, by assessing their impact on uptake of the HPV vaccinations. The study also aims to examine the modifying role of recipients' deprivation level and to addresses the uncertainty regarding the speculated unintended consequences of incentives on decision-making processes. Results indicate that although incentives increased vaccination completion rates, impacts were not modified by recipients' deprivation level and uptake remained lower than the national target, necessitating consideration of other ways of achieving it. The quality of decisions to get vaccinated was unaffected by the offer of incentives. Knowledge of the vaccination's side-effects, however, was not assessed in this study. Findings therefore, are not conclusive about the impact of incentives on the processing of risk-relevant information.

Study 4 is a web-based experiment addressing the uncertainty regarding the speculated unintended consequences of financial incentives on information processing. It aims to determine the impact of incentives on the processing of risk-relevant information associated with an incentivised behaviour with potential adverse effects, as assessed by participants' perceived risk related to engaging in the behaviour and their knowledge of its side-effects. The findings provide no evidence for the unintended consequences of incentives on the processing of risk-information.

The thesis concludes with a discussion of the main findings and related implications for practice, policy and future research.

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Chapter 1

Thesis Overview

Rationale and uncertainties

Considerable morbidity and premature mortality could be avoided if individuals changed their behaviour and in particular, to stop smoking, reduce consumption of alcohol and calories from food, increase their levels of physical activity and increase their uptake of recommended vaccinations. Modifying health-related behaviour, however, is challenging: Although many people want to alter their behaviour to improve their health, they find it difficult to implement and maintain the necessary changes. One potential intervention that is being considered in the UK and elsewhere is to offer individuals financial incentives for changing their health-related behaviours. Several aspects of the evidence regarding the impact of these interventions remain unclear. First, there is uncertainty regarding the effectiveness of incentives in achieving sustained changes when used to promote repeated health behaviours, as well as of the factors that modify their effectiveness. Second, the variables that might confound the impact of incentives on health-related behaviours remain unexplored. Finally, their speculated unintended consequences on cognitive processes, including information processing and decision-making, have yet to be examined systematically. This thesis aims to reduce these uncertainties.

Thesis aims

The aim of this thesis is to assess the behavioural and cognitive consequences of using financial incentives to change health-related behaviours. In addressing this aim, the thesis has the following objectives:

1) To estimate the effectiveness of financial incentives in changing health-related behaviours (Chapters 3,4, 6 &7)
   i) regardless of whether they are still offered
   ii) when they have been discontinued (sustained effectiveness)

2) To examine the factors that modify the impact of financial incentives on health-related behaviours (Chapters 3,4, 6 &7)

3) To explore the possible confounding variables that inadvertently might influence the impact of financial incentives on health-related behaviours (Chapters 3, 4 & 5)

4) To assess the impact of financial incentives on the quality of people's decisions to engage in incentivised behaviours (Chapters 6, 7 & 8)

Background to the thesis

Chapter 2 provides an overview of the context in which this thesis is embedded. It is a narrative review of the literature on the determinants of health-related behaviours, the use of behaviour change techniques and the use of financial incentives for changing health-related behaviours. The rational for investigating the latter is presented against the need for continued work in identifying techniques that are effective in changing health-related behaviour. The evidence for the effectiveness of financial incentive schemes is reported alongside the uncertainties and concerns regarding their use. The chapter concludes with an outline of the ways in which this thesis aims to reduce these uncertainties.

Reviewing the literature on the use of financial incentives for changing repeated health-related behaviours

Chapters 3 and 4 present Study 1, a systematic review and meta-analysis of research assessing the use of financial incentives across repeated health-related behaviours: smoking cessation, healthier eating, including reduced alcohol consumption and increased physical activity. The review examines the extent to which incentives result in sustained health-behaviour change i.e. change that is evidenced after removal of the incentives. It further assesses the role of potential effect modifiers, including the target behaviour, the value and type of the incentive (i.e. whether incentive attainment is certain or uncertain) and recipients' level of deprivation. Finally, it examines the role of some study characteristics in confounding the effectiveness of financial incentives. Chapter 3 presents the review protocol and Chapter 4 presents the review findings.

Exploring potential variables that confound the effectiveness of financial incentives for changing health-related behaviours

Chapter 5 presents Study 2 which complements findings from Study 1, by exploring how the effectiveness of financial incentives for changing repeated health-related behaviours may be overestimated due to some trials failing to standardise study procedures between incentivised and control groups. The study is qualitative in method and explores the variables in study designs that could potentially confound the attribution of effectiveness to financial incentives.

Assessing the impact of financial incentives on uptake of the HPV vaccination and the quality of decisions to engage in incentivised behaviours

Chapters 6 and 7 present Study 3 which, based on the evidence that financial incentives are most effective in promoting simple, one-off behaviours, such as getting vaccinated, assesses for the first time the impact of financial incentives on uptake of the HPV vaccination. The study, which is a randomised controlled trial, further examines the modifying role of participants' level of deprivation on uptake of the vaccination, as well as the impact of incentives on the quality of decisions to get vaccinated. Chapter 6 presents the trial protocol and Chapter 7 presents the trial findings.

Further exploration of the impact of financial incentives on the quality of decisions to engage in incentivised behaviours

Chapter 8 presents Study 4 which builds on the findings from Study 3 showing that the quality of decisions to engage in incentivised behaviours is unaffected by the offer of incentives. This web-based experiment further assesses the effects of financial incentives on decision-making, by examining their impact on the processing of risk-relevant information in the context of offering financial incentives for performing a behaviour with potential adverse side-effects. It also examines the extent to which any impacts are modified by cognitive load.

Conclusion and implications

The thesis closes with Chapter 9, a discussion of the main findings and their related implications for practice, policy and future research.

Chapter 2

Background to the thesis

Abstract

This chapter aims to provide the context within which this thesis was developed, by presenting a narrative review of the relevant literature. It begins by outlining the link between behaviour and health and by highlighting the rationale underlying the need to develop interventions to change health-related behaviours. It continues with a consideration of the determinants of health behaviour and an examination of existing behaviour change techniques, emphasising the need for continued work in identifying techniques that are effective in changing health-related behaviour. Following from this conclusion, financial incentives are introduced as a potentially effective behaviour change technique and a detailed analysis is presented on their use in schemes aimed at changing health-related behaviours. The evidence for their effectiveness is reported alongside the related uncertainties and concerns regarding their potential unintended consequences on decision-making and information-processing. The chapter concludes with a summary of the issues surrounding the use of financial incentives schemes that require elucidating and an outline of the ways in which this thesis addresses these.

Behaviour and health

Behaviour is an important determinant of health worldwide. For example, tobacco use, poor diet-related behaviours, including the harmful use of alcohol, and physical inactivity contribute to the development of the major non-communicable diseases (NCDs), comprising cardiovascular disease, type 2 diabetes, cancer and chronic respiratory diseases (Andersen, Schnohr, Schroll et al., 2000; Batty, Kivimaki, Gray et al., 2008; Batty, Shipley, Marmot et al., 2001; Cox, Whichelow & Prevost, 2000; He, Nowson, Lucas et al., 2007; Heidemann, Schulze, Franco et al., 2008; Jeffery, 2012; Teo, Ounpuu, Hawken et al., 2006). Evidence from a longitudinal study (Khaw, Wareham, Bingham et al., 2008) suggests that individuals who engage in all the aforementioned unhealthy behaviours are four times more likely to die within just over a decade, compared to people who do not smoke, are physically active, consume alcohol in moderation and adhere to the daily recommendations for fruit and vegetable consumption. Indeed, the non-communicable diseases associated with these unhealthy behaviours account for more than 50% of premature preventable deaths worldwide (3four50.com; WHO, 2012). Eighty percent of these deaths occur in low and middle-income countries (WHO, 2008a; WHO, 2011), illustrating the socially patterned

prevalence of non-communicable diseases and their contribution to health inequalities, both between and within countries (WHO, 2008b). The morbidity and mortality burden of these diseases affects people in all age groups, and imposes large, increasing and avoidable costs in human, social and economic terms (Beaglehole, Bonita, Alleyne et al., 2011; WHO, 2012). Furthermore, infectious diseases, such as viral hepatitis, influenza, and tuberculosis, remain among the leading causes of global illness and death. Their spread is in part attributable to insufficient vaccination uptake, which could prevent 2-3 million deaths worldwide (WHO, UNICEF & Bank., 2009).

These findings suggest that considerable morbidity and premature mortality could be avoided if individuals changed their behaviour. Modifying health-related behaviour, however, is difficult: Although many people want to alter their behaviour to promote their health, they find it difficult to implement and maintain the necessary changes (Ogden, Karim, Choudry et al., 2007; Sutton, 1998). This has resulted in on-going interest in the development of interventions that are effective in changing individuals' and populations' health-related behaviours.

Changing health-related behaviour

Over the last few years, numerous attempts have been made to encourage people to adopt healthier behaviours. Changing health-related behaviours has become a high priority of governments around the world, including the UK, as advocated by the publication of many related reports, such as the National Institute of Health and Clinical Excellence's (NICE) guidance on behaviour change (2007) and the House of Lords Science and Technology Committee's (2011) inquiry into the use of behaviour change interventions for achieving government policy goals. As a result, a multitude of interventions have been designed to promote health. These have targeted individuals, communities and populations and have been effective to varying degrees.

In recent years it has become accepted that effective health behaviour-change interventions are likely to be those which have been informed by empirical evidence and theories of health behaviour (Haefner & Kirscht, 1970; Michie & Abraham, 2004). The use of theory in designing interventions has been supported for three main reasons. First, theory provides a framework for identifying and understanding the determinants of behaviours and behaviour change and their potential influence. Therefore,

interventions that target such determinants are likely to be more effective. Second, evaluations of theory based-interventions allow for theory to be tested. Third, as theory-based interventions improve our understanding of what is effective, they assist in the progress and development of theory across behaviours, populations and contexts (Michie, Johnston, Francis et al., 2008). The need to develop theory-based interventions resulted from the observation that many existing interventions were only minimally effective, with most not being theoretically driven (Abraham, Krahé, Dominic et al., 2002; Fisher & Fisher, 1992; Oakley, Fullerton, Holland et al., 1995; Sherr, 1987), while those that were theoretically driven were more effective (e.g. Bryan, Aiken & West, 1996; Fisher, Fisher, Misovich et al., 1996; Kalichman, Carey & Johnson, 1996).

This following section reviews some of the issues regarding the effectiveness of health-related behaviour change interventions.

Determinants of health behaviour

Traditionally within health psychology and other disciplines such as economics, individuals' actions have been viewed as reasoned, conscious and intentional. Various theories have therefore been developed (e.g. Protection Motivation Theory (Rogers, 1983); Health-Belief Model (Janz & Becker, 1984); Transtheoretical Model of Change (Prochaska, DiClemente & Norcross, 1992)) which assume that health behaviour is the result of cognitive appraisal processes of the (a) expectancy and value of potential health threats and (b) possible coping responses (Hofmann, Friese & Wiers, 2008a). These theories identify the psychological constructs assumed to influence these processes, thus providing potential targets for behaviour-change interventions, as well as the frameworks for understanding intervention effects (Johnston, 1995; Sniehotta, 2009b).

Numerous health-behaviour theories exist, specifying a number of such constructs, description of which goes beyond the aim of the present review. It is worth noting, however, that in reviewing the theoretical cognitive constructs included in a number of social cognitive models and self-regulation theories, Abraham, Sheeran & Johnston (1998) highlighted the role of self-efficacy beliefs, intention formation, attitudes, normative beliefs and self-representations as having the potential to influence people's motivation to engage in health behaviours, as well as their actual behaviours, thus providing a framework for intervention design.

On the whole, however, interventions designed to alter constructs influencing goal-directed behaviour and reasoning, such as attitudes, beliefs and intentions, have had only small to medium effects on behaviour (Hardeman, Johnston, Johnston et al., 2002; Sheeran, Harris & Epton, in press; Sniehotta, 2009a; Webb & Sheeran, 2006; WHO, 2008c). As Sheeran, Gollwitzer & Bargh (2012) have recently argued "changing conscious thought does not, it seems, guarantee health behaviour change", especially of the magnitude needed to reduce the global burden of disease (Marteau, Hollands & Fletcher, 2012).

More recently, the role of unconscious processes in determining health behaviours has become a focus of research. This is reflected in the development of dual-processing models, such as the Reflective-Impulsive Model (Strack & Deutsch, 2004), which proposes that health behaviour is governed by two interacting information-processing systems: the reflective system that generates behavioural decisions based on knowledge about facts and values, and the impulsive system that elicits behaviour through associative links and motivational orientations that the person has acquired over many experiences. According to the model, both these systems activate behavioural schemata, which are sometimes incompatible (Strack & Deutsch, 2004). For example, a tempting dessert may generate antagonism between the impulse to eat it and the goal to lose weight, resulting in conflict. Selection of the schema which determines behaviour depends on the relative strength of activation for each, with certain situations and dispositional conditions shifting the potential for schemata activation in favour of one of the two systems (Strack & Deutsch, 2004). For example, being hungry and in the presence of people who are eating makes it more likely that the impulse to eat is acted on.

The significance of unconscious processes is increasingly being supported by accumulating evidence illustrating that people's cognitions, feelings, and behaviour are guided both by implicit and explicit processes (Sheeran et al., 2012). Acknowledgement of the former's importance can help explain the lack of significant behavioural changes afforded by a focus on reflective processes (Marteau et al., 2012; Sheeran et al., 2012). Dual-processing models, such as the Reflective-Impulsive Model, allow for the adoption of a more holistic approach to the understanding of health behaviour and highlight the importance of constructs not specified by earlier theories, such as the role of people's implicit attitudes (i.e. evaluation of an object or behaviour outside conscious

awareness) in influencing health-related choices (e.g. Hollands, Prestwich & Marteau, 2011). Dual-processing models also emphasise the role of the environment in determining health behaviour by acknowledging that environmental stimuli can cue automatic responses and actions. By highlighting the involvement of these additional potential determinants of health behaviour, a focus on unconscious processes offers new possible targets for intervention, as well as the opportunity to use behaviour-change strategies, which may complement those targeting reflective processes and thus enhance the effectiveness of behaviour change efforts (Sheeran et al., 2012).

Behaviour change techniques

From the above it is evident that the factors influencing health behaviours are numerous and the mechanisms by which they do so are complex. For example, a person's success, e.g. Mark's, in trying to lose weight might depend on his ability to refrain from eating many sweets and desserts. This in turn might depend on factors influencing his reasoning, such as whether he knows that eating many sweets hinders weight-loss, how much he likes eating sweets, or whether he believes he can avoid eating many sweets and desserts. It might also depend on environmental factors influencing his impulsive system, such as whether sweets and desserts are sold in the workplace cafeteria, the availability of healthy alternatives from which he could choose to satisfy his sweet-tooth, whether he's exposed to advertisements that cue sweet consumption, whether he finds himself in situations he's associated with sweet-eating, such as the cinema, or whether other people around him are eating sweets. How many sweets he eventually eats could also depend on the size of their packaging or the colour of the plate he uses to eat from, as well as on whether he's distracted or preoccupied while eating. All of these factors have been shown to affect food consumption (Wansink, 2004). Therefore, it comes as no surprise that interventions to change health-related behaviours are usually complex, consisting of many components. These components, i.e. the behaviour-change techniques which comprise the intervention and the procedures involved in their delivery, are crucial to intervention effectiveness, with their identification being a requirement for understanding when and why an intervention works (Michie & Abraham, 2008; Michie, Abraham, Eccles et al., 2011a). Evaluation of behaviour-change techniques alone and in combination, is important for identifying how change is achieved by successful interventions (Michie & Abraham, 2004).

Although health behaviour theories make assumptions about the determinants of behaviour, they often do not specify the techniques by which to change these (Hardeman et al., 2002; Sniehotta, 2009a). Consequently, numerous behaviour change strategies have been used within interventions. The effect size of many of these has been empirically estimated. For example, facilitating the transformation of intentions into behaviour through the use of implementation intentions (Gollwitzer, 1999; Gollwitzer, 1993) has been successfully applied and evaluated (e.g. Orbeil, Hodgldns & Sheeran, 1997; Sheeran, 2002). Similarly, strategies to enhance self-efficacy (Bandura, 1986), such as verbal persuasion, modelling, selective attention to past successes and sequential mastery experiences have also been widely applied and found to lead to behaviour change (Bandura, 1992; Bandura, 1997; Bandura, 1998).

Interventions, however, have not always included empirically or theoretically supported change techniques (Dombrowski, Sniehotta, Avenell et al., 2007; Hardeman et al., 2002). This, in combination with the problematic variability in the reporting of intervention content -attributed to the absence of standardised definitions of behaviour change techniques (Abraham & Michie, 2008) -- and the lack of sufficient details in technique description (Michie & Abraham, 2004) inhibits understanding of (a) what entails an effective intervention, as well as (b) the conditions that influence effectiveness. To help resolve this problem, Michie, Johnston, Francis and colleagues (2008) generated a list of behaviour-change techniques accompanied by related definitions and identified links between these techniques and theory-based determinants of behaviour. Furthermore, Abraham & Michie (2008) developed a taxonomy of twenty-six generally applicable behaviour change techniques which could be reliably identified across 195 published descriptions of interventions for increasing physical activity and healthier eating. This taxonomy was subsequently revised and expanded to forty techniques (Michie, Ashford, Sniehotta et al., 2011b) and was recently further expanded to ninety-three techniques (Michie, Richardson, Johnston et al., 2013). It has also been extended to other behaviours, such as smoking cessation (Michie, Hyder, Walia et al., 2011c).

The information generated by using such standardised definitions is important as it enables i) identification of the techniques that contribute to intervention effectiveness; ii) accurate appraisal of the scientific evidence that is produced and ii) standardisation, which is necessary for linking behaviour change techniques to mechanisms of action

and therefore elucidating the mechanisms by which interventions work (Michie et al., 2011b). Such information is fundamental for designing optimal interventions (Michie et al., 2011b), as well as theory development (Sniehotta, 2009b). Having these shared labels and definitions has given systematic reviewers the opportunity to synthesise different interventions and attempt to identify the behaviour-change techniques that are effective for changing different behaviours (e.g. Albarracín, Gillette, Earl et al., 2005; Dombrowski, Sniehotta, Avenell et al., 2012a; Michie et al., 2011b; Michie, Jochelson, Markham et al., 2009b). For example, out of ten distinct techniques identified in descriptions of interventions to promote condom use, provision of normative arguments appears to be the most effective (but only for those under the age of 21 years) (Albarracín et al., 2005). For increasing physical activity and healthier eating, Michie, Abraham, Whittington et al. (2009a) found that the technique 'self-monitoring' is important in increasing intervention effectiveness, while for reducing obesity in adults with obesity-related co-morbidities, successful interventions are potentially those which include 'provision of instructions', 'self-monitoring', 'relapse prevention' and 'prompting practice' (Dombrowski et al., 2012a). Interestingly, findings also suggest that effective interventions may be those that incorporate fewer behaviour-change techniques (Michie et al., 2009b), with those including more not necessarily being associated with better outcomes (Dombrowski et al., 2012a). This taxonomy of behaviour change techniques has also been used to describe and design new behaviour change interventions (e.g. Araújo-Soares, McIntyre, MacLennan et al., 2009; Dombrowski, Sniehotta, Johnston et al., 2012b; Sniehotta, Dombrowski, Avenell et al., 2011).

Most of the behaviour-change techniques included in the original taxonomy by Abraham & Michie (2008) were identified from interventions targeting reflective processes. As mentioned previously, however, efforts to change health behaviours could be complemented by the use of behaviour-change techniques that target unconscious processes. A recent review of research on implicit processes and health has identified a number of such potentially effective techniques (Sheeran et al., 2012), such as evaluative conditioning (i.e. altering the valence of a stimulus by pairing it with positive or negative stimulus (Hofmann, De Houwer, Perugini et al., 2010)) which can change health-behaviour by altering related implicit attitudes (Hollands et al., 2011). Techniques that target automatic processes by modifying individuals' environment also hold the potential of effectively changing health-related behaviours (Marteau et al.,

2012). For example, increasing the availability of healthier options within an environment, such as the number of healthier snacks in a vending machine, can promote selection of healthier choices (French, Hannan, Harnack et al., 2010). Given that only a minority of those exhibiting unhealthy behaviours participate in health promotion programmes, one of the advantages of behaviour-change techniques that target unconscious processes compared to those that target reflective processes, is that the former do not require deliberate engagement on behalf of individuals or direct contact with them. As such, their delivery might be more efficient and cost-effective, thus holding the potential of being applied at a population level (Marteau et al., 2012). Furthermore because their use does not rely on individuals' level of literacy, numeracy and cognitive control, which are often underdeveloped in the most socially deprived (Kutner, Greenberg, Jin et al., 2006; Spears, 2010; Williams, 2003), such techniques also hold the potential of reducing health inequalities (Marteau et al., 2012).

The need for continued work in identifying effective behaviour change techniques

Even though much research into designing effective ways for promoting health has been conducted and significant progress is being made towards identifying the strategies that generate health-behaviour changes, many people today continue to behave in unhealthy ways (Ogden, 2012). For example, although smoking rates in the UK have decreased significantly in the last 30 years (from 39% in 1980 to 21% in 2009) (The NHS Information Centre for Health and Social Care, 2011b; Wald & Nicolaides-Bouman, 1991), a substantial minority of the population continues to smoke, with the prevalence of smoking being twice as high amongst the most deprived populations compared to those least deprived (The NHS Information Centre for Health and Social Care, 2011b). Furthermore, rates of obesity in the UK are rising, with over a quarter of British adults classified as obese in 2010 (The NHS Information Centre Lifestyle Statistics, 2012). The biggest challenge in promoting healthy behaviours has been to identify the strategies that encourage people to both initiate the required changes and sustain them, as illustrated by the case of obesity and weight management. Over the past few decades much research has been devoted to designing interventions to reduce obesity and control weight, resulting in the development of many treatments. For obesity, the most effective treatment appears to be surgery (Maggard, Shugarman, Suttorp et al., 2005; Picot, Jones, Colquitt et al., 2009), which can result in sustained changes, but is invasive

and with potentially serious adverse side-effects (Picot et al., 2009). For weight-loss in the overweight, recent evidence suggests that commercial programmes, such as Weight Watchers can effectively reduce weight (Jebb, Ahern, Olson et al., 2011; Jolly, Lewis, Beach et al., 2011). Although these types of treatment could lead to sustained weight loss, with effects observed at least up to 12 months from the beginning of interventions (Jolly et al., 2011; Picot et al., 2009), in general most people who lose weight do not manage to maintain their weight-loss in the longer-term (Glenny, O'meara, Melville et al., 1997; Jeffery, Epstein, Wilson et al., 2000; Wing & Phelan, 2005).

One of the problems with existing interventions aimed at changing health-related behaviours is that their development has not been informed by evidence (Dombrowski et al., 2007). There is a need to further our understanding of which strategies are most effective in achieving sustained behaviour changes and to systematically assess those which have the potential of promoting health, but have so far remained unevaluated.

The role of financial incentives in changing behaviour

Behaviour-change techniques involving identification of reinforcers and changing the consequences of a behaviour have been widely and successfully applied across behaviours (e.g. Sarafino, 2001; Walker, 1984). Indeed providing contingent rewards, the use of punishment and the use of negative reinforcement are all behaviour-change techniques that have been used in health-behaviour change interventions and are included in the existing taxonomy of behaviour-change techniques (Abraham & Michie, 2008; Michie et al., 2008; Michie et al., 2013). One potentially effective strategy for changing the consequences of a behaviour and improving individuals' health-related behaviours is to use financial incentives.

Financial incentives can be defined as a) the offer of cash or cash-like rewards (such as vouchers that can be exchanged for goods or services) contingent on the performance or achievement of one or more pre-specified health-related behaviours or outcomes and/or b) the imposition of financially-related penalties contingent on the non-performance or non-achievement of one or more pre-specified health-related behaviours or outcomes (Adams, Giles, Robalino, McColl & Sniehotta 2012). Financial incentive schemes are increasingly being considered and applied in health policies around the world in an attempt to promote health-enhancing behaviours (Lagarde, Haines & Palmer, 2007; Le

Grand, 2008). They have been used most often in low and middle income countries as part of programmes which aim to reduce poverty and health inequalities. These programmes use 'conditional cash transfers' that are delivered to families, if certain health and educational criteria have been met (Lagarde et al., 2007). They have also been used in high-income countries to target some health behaviours, including tobacco use, unhealthy eating and lack of physical activity (e.g. APM Health Europe, 2007; North East Essex NHS Trust, 2009). Most financial incentive schemes involve the offer of a reward, such as a cash payment, a voucher or a prize, which is delivered if a pre-specified behaviour or outcome has been achieved. Other schemes involve the use of a 'deposit-contract' whereby individuals pledge their own money, which they lose if they fail to meet their goals. Uncertainty remains, however, with regards to whether and how financial incentives work in changing behaviour to promote health (Marteau, Ashcroft & Oliver, 2009).

This thesis focuses on financial incentives provided in various forms, including cash payments, vouchers, chances to win lotteries, prizes, gifts or deposit contracts. It excludes the following:

(a) incentives of little, no monetary or symbolic value (e.g. certificates, stickers, badges, key-rings, t-shirts, caps, hats or mugs),
(b) incentives that are not contingent on individual performance of the target behaviour or achievement of the target outcome (e.g. consumer sales promotions, direct pricing, income transfer programs, tax credits),
(c) incentives that are offered to health-care providers for improving health-service access and delivery. (p 26)

Financial incentives and behaviour

The importance of money in contemporary society is evident: people require money to satisfy their everyday needs and strive to obtain it. The valence of money, however, lies not only in its instrumentality, but also in the symbolic value it has acquired through its perceived association with prestige, status, and other factors (Furnham & Argyle, 1998; Zelizer, 1997). Given the power of money, it comes as no surprise that the past few decades have witnessed an increased interest in the potential impact of monetary incentives on behaviour.

In theory, financial incentives are likely to operate on behaviour both via the impulsive and reflective information processing systems. According to learning-theory, linking the target behaviour to a positively evaluated stimulus (e.g. a reward with monetary value), which is delivered close in time to the performance of the behaviour, strengthens the value associated with the behaviour (Marteau, 2010). From an economics perspective, this increases the utility gained from performing the target behaviour, thus providing an impetus for individuals to act (Camerer & Hogarth, 1999; Dawes, 1999; Hertwig & Ortmann, 2001; Lopes, 1994; Zwick, Erev & Budescu, 1999). At the same time, financial incentives might work according to the axioms of Social Cognitive Theory (Bandura, 1986; Bandura, 1997; Bandura & McClelland, 1977), by shifting people's outcome expectations of the likely consequences of the target behaviour in a positive direction, or by removing perceived barriers, thus increasing their self–efficacy. In a similar manner, incentives might influence people's perceived behavioural control and attitudes towards the target behaviour and in turn their intentions, as predicted by the Theory of Planned Behaviour (Ajzen, 1985; Ajzen, 1991). They might also operate by facilitating allocation of limited cognitive capacity, in such a way as to achieve the now more highly valued target behaviour (Marteau, 2010). These possibilities suggest that financial incentives may enable people to overcome the costs and barriers associated with initiating the target behaviour and/or shift their perception of the related cost-benefit ratio, such that the benefits of performing the related behaviour outweigh the costs. Either way, financial incentives have the potential to move individuals past the 'threshold' needed to act. Offering incentives for a sufficient number of occurrences -- with the exact number depending on a various factors, such as the target behaviour and the value of the incentive (See table 2.1 for a list of potential effect modifiers) -- thereby allowing individuals to experience the beneficial consequences of the target behaviour, could therefore promote the development of new habits (Charness & Gneezy, 2009).

People, however, might not always respond to incentives as predicted. Indeed, findings indicate that monetary rewards have varying effects on behaviour (Bonner, Hastie, Sprinkle et al., 2000; Camerer & Hogarth, 1999; Gerhart & Milkovich, 1992; Jenkins Jr, 1986; Jenkins Jr, Mitra, Gupta et al., 1998; Kohn, 1993; Young & Lewis, 1995). For many tasks, such as memory or recall tasks, probability matching and multicue probability learning and clerical tasks, they seem to enhance performance (e.g. Camerer & Hogarth, 1999; Kahneman & Peavler, 1969; Libby & Lipe, 1992), while for others, such as those involving market trading, bargaining, and risky choices, they have no

effect (e.g. Camerer, 1990; Forsythe, Horowitz, Savin et al., 1994; Fouraker & Siegel, 1960; Güth, Schmittberger & Schwarze, 1982; Neelin, Sonnenschein & Spiegel, 1988). In certain situations they may even inhibit performance, such as when engaging in some judgment and decision-making tasks (e.g. Arkes, Dawes & Christensen, 1986; Ashton, 1990; Camerer & Hogarth, 1999; Hogarth, Gibbs, McKenzie et al., 1991) or tasks considered by participants as interesting (Deci, Koestner & Ryan, 1999). Taken together, these findings imply that the impact of financial incentives on behaviour depends on many factors.

Financial incentives and health-behaviour

When applied to health contexts, financial incentive schemes hold the potential of evoking health-behaviour changes, thereby reducing the burden of non-communicable and infectious diseases. The impact of such schemes, however, does not seem equal across all types of health behaviours (Jochelson, 2007) and several aspects of their effectiveness remain unclear (Marteau et al., 2009).

In some situations even small financial incentives can encourage healthy behaviours (Sutherland, Christianson & Leatherman, 2008). Incentives have been shown most effective in promoting simple, one-off behaviours, such as attending clinic appointments, undergoing vaccinations, attending mammography and tuberculosis screening, and adhering to healthcare treatments (Sutherland et al., 2008). When used to modify complex, repeated health-related behaviours that contribute to non-communicable diseases, there is uncertainty regarding the conditions under which change is achieved and sustained after the intervention is discontinued (Hagger, Keatley, Chan et al., 2013; Jochelson, 2007; Marteau et al., 2009). Findings suggest that financial incentives are effective in achieving short-term changes (i.e. for the duration incentives are offered) to these behaviours (e.g. Jochelson, 2007; Sutherland et al., 2008). The strongest related evidence derives from interventions involving the use of financial incentives in drug abstinence programmes (Lussier, Heil, Mongeon et al., 2006; Prendergast, Podus, Finney et al., 2006), although their effectiveness in achieving sustained changes (i.e. after the incentive is discontinued) in this context has yet to be assessed (Marteau et al., 2009). It has, however, been examined in the context of other complex health-related behaviours, such as smoking and weight reduction, but findings have been inconclusive. For example, a Cochrane review of the effects of incentives on smoking cessation identified only one study (amongst 19 included) reporting evidence

of sustained cessation beyond discontinuation of the incentives (Cahill & Perera, 2011; Volpp, Troxel, Pauly et al., 2009). This study included a large sample size and used high-value incentives. This is in contrast to most of the trials included in the review, which were underpowered and offered only small incentives (Marteau et al., 2009; Troxel & Volpp, 2012). The negative findings of the review may therefore have resulted from the inclusion of studies with problematic trial designs and could thus be regarded as misleading (Troxel & Volpp, 2012). A similar pattern has also been observed in the context of financial incentives for weight-loss. A meta-analysis of relevant studies found no evidence of a sustained effect at 12 or 18 month follow-up (Paul-Ebhohimhen & Avenell, 2008). As with the smoking cessation review, included studies had very small sample sizes and were thus possibly underpowered to detect any potential effects of incentives. Furthermore, although results of the meta-analysis suggested that incentive effectiveness could depend on the amount offered, as revealed by a weak trend in favour of incentives comprising more than 1.2% of individuals' incomes, approximately half of the included studies offered only small incentives (Paul-Ebhohimhen & Avenell, 2008). Given all the above, it is apparent that there is a need to clarify the impact of financial incentives on complex health-related behaviours, and to elucidate the conditions under which they are most likely to result in sustained behaviour changes.

The second uncertainty regarding the effectiveness of financial incentives for changing health-related behaviours concerns the factors that might modify their impact. Studies assessing the effects of financial incentives on health-behaviours have produced mixed results. This might be partly due to the use of incentives schemes whose design has not been informed by theory or pre-existing evidence and have thus failed to account for the possible variables that might influence behavioural responses to incentives (See Table 2.1). For example, most of the studies included in the two aforementioned reviews of the impacts of financial incentives on smoking cessation and weight-loss did not justify the choice of the amount, frequency or method of delivery of the financial incentives used. (Cahill & Perera, 2011; Paul-Ebhohimhen & Avenell, 2008). Furthermore, most offered only small-value incentives. This is in contrast to the principles of learning theory, as well as those of economic theory and social cognitive theory, which specify that larger reinforcements lead to greater behaviour change. This could imply a lack of understanding of the mechanisms by which incentives lead to behaviour change. Understanding these mechanisms is critical for determining how to maximise the

effectiveness of monetary incentives (Bonner, 1999) and for designing optimal incentive schemes.

As can be seen in Table 2.1, various factors might modify how incentives influence behaviour. These can be described in four categories i) incentive scheme characteristics; ii) recipients' social and psychological characteristics; iii) the type of behaviour for which incentives are offered and iv) the context within which incentives are offered (Jochelson, 2007; Sutherland et al., 2008). Assumptions regarding the importance of some of these variables, such as incentive value (e.g. Jochelson, 2007; Sutherland et al., 2008), incentive type (e.g. certain or uncertain (Leung, Ho, Chan et al., 2002)) and recipients' deprivation level (e.g. Sutherland et al., 2008) have often been discussed in the literature. In reality little is known about the actual factors that modify behavioural responses to incentives (Bonner & Sprinkle, 2002). Research in the area of drug abstinence provides some evidence that more immediate incentive delivery and greater monetary value are associated with larger incentive effect sizes (Lussier et al., 2006). Research in the area of smoking cessation (Heil, Higgins, Bernstein et al., 2008; Heil, Tidey, Holmes et al., 2003; Higgins, Wong, Badger et al., 2000) has also shown that a high frequency reinforcement schedule that becomes gradually less frequent over time, escalates in value with successive confirmations of abstinence and includes a reset contingency (i.e. whereby failure resets the incentive value back to the initial level) could be effective in obtaining initial abstinence, which is associated with longer-term abstinence (Gourlay, Forbes, Marriner et al., 1994; Higgins et al., 2000; Kenford, Fiore, Jorenby et al., 1994; Yudkin, Jones, Lancaster et al., 1996). These latter findings, however, have mostly derived from laboratory-based studies conducted under highly controlled conditions (e.g. frequency of monitoring and provision of incentives as high as three times a day (Heil et al., 2003; Roll & Higgins, 2000)) and may therefore not be generalisable to smoking behaviour in the general population, nor transferable to other health-related behaviours. Indeed, the variables that influence the impact of incentives on one type of behaviour may not necessarily have an effect on another type of behaviour. Furthermore, variables might interact with each other to produce different effects under different circumstances.

Clarification of the mechanisms by which financial incentives operate on behaviour, as well as of the nature and exact role of the potential modifiers displayed in Table 2.1, would enable a better understanding of the processes through which financial incentives

work. This in turn could lead to the design of more effective financial incentive schemes.

Table 2.1. Potential modifiers of the impact of financial incentives on health-related behaviours: an informative but not exhaustive list

Incentives	
Type	Positive (reward) vs. Negative (penalty) Exchangeable (e.g. voucher) vs. Non exchangeable (e.g. gift) Certain (e.g. voucher) vs. Uncertain (lottery ticket) Related to target behaviour (e.g. voucher for healthy groceries) vs. Not related to target behaviour Contingent on behaviour vs. Non-contingent
Value	High vs. Low
Delivery	Immediate vs. Delayed
Schedule	Intermittent vs. Continuous Fixed vs. Incremental Incremental w/ value reset (in case of non-adherence) vs. W/out value reset
Duration	Behaviour achievement vs. behaviour achievement and sustained change
Contingency	Change to target behaviour (e.g. healthier eating) vs. Change to index of target behaviour (e.g. weight-loss) vs. Change to indirect behaviour (e.g. purchasing healthy foods)
Beneficiary	Self vs. Family vs. Community (charity donation)
Source	Government vs. Employer vs. Health Insurance vs. Self
Recipients	
Social & material resources	Educational level, Income, Occupation
Population	General vs. Patients vs. Employees
Psychological resources	Self-efficacy, Motivation , Self-regulation skills, Time orientation
Behaviour	
Frequency	One-off (e.g. vaccination uptake) vs. Repeated (e.g. smoking cessation)
Unhealthy vs. healthy	Stopping (e.g. smoking) vs. starting (e.g. physical activity)
Control	Addictive (e.g. smoking) vs. non-addictive (e.g. sedentary behaviour) High volitional control (e.g. smoking cessation) vs. low volitional control (e.g. vaccination uptake)
Context	
Country wealth	High vs. Middle vs. Low income
Health care system	Privatised vs. Socialised
Support system	Incentive part of effective behavioural intervention vs. Not
Prevalence of behaviour	High vs. Low
Setting	Workplace vs. Medical vs. Community

The unintended consequences of financial incentives on the quality of decisions to engage in incentivised behaviours

Unlike most interventions designed to change behaviour, the use of financial incentives raises particular concerns regarding their potentially adverse effects on the quality of people's decisions to engage in incentivised behaviours. This is particularly relevant to behaviours associated with possible adverse side-effects, such as taking certain medicines, receiving immunisation, and attending screening appointments.

One way to judge the quality of a decision to engage in an incentivised behaviour is to assess whether it represents an informed choice. A decision is considered informed (and thus of high quality) when it is based on salient knowledge and acting on it is in line with the decision-maker's attitudes (Marteau, Dormandy & Michie, 2001). Related to the former is the need to ensure that the risks associated with the incentivised behaviour have been fully processed. Marteau, Ashcroft & Oliver (2009) point out that the prospect of receiving a financial reward could result in the risks associated with a particular health behaviour being overlooked. There are two possible ways that this could occur: firstly, monetary incentives might lead people to ignore or not process risk information; secondly, people may process risk-related information but perceive the risks to themselves as low.

Based on the above, being presented with financial incentives does not necessarily compromise the quality of people's decisions to engage in an incentivised behaviour. Even if individuals choose to value the incentive more highly than they value any possible negative outcome or risk, the quality of their decision to engage in the behaviour would remain intact as long it were informed and the related risk-information were fully processed.

To date, no know studies have attempted to assess the mechanisms by which financial incentives influence the decision-making processes involved in engaging in an incentivised health-behaviour. Discussions and research within two conceptually analogous domains could help elucidate the issue. The first involves the use of payments for live organ donations, which have been criticised for undermining donors' ability to calculate the related risks (e.g. Becker & Elias, 2007; Olbrisch, Benedict, Haller et al., 2001). Partial support for this claim derives from studies investigating the economic and health consequences of selling kidneys in India (Goyal, Mehta,

Schneiderman et al., 2002) and Pakistan (Naqvi, Ali, Mazhar et al., 2007). Findings show that the majority of vendors were very poor and sold their organs to pay off debts, but would not recommend others to do the same. This could be interpreted as an indication that sellers were unaware of the negative consequences associated with organ donation. However, no conclusions can be drawn regarding whether they were inadequately informed of the likely outcomes or whether money led them to ignore the risks or perceive them as low. Recent research shows that as the risk of renal failure increases, individuals' become less willing to donate kidneys, regardless of the level of payment offered, therefore suggesting that financial incentives do not blind people to the risks of living kidney donation (Halpern, Raz, Kohn et al., 2010).

The second related research area involves the use of financial incentives for participation in research, including clinical trials. Payments increase individuals' willingness to participate in research (Bentley & Thacker, 2004; Singer, Groves & Corning, 1999; Slomka, McCurdy, Ratliff et al., 2007). Their use has been criticised, however, for being undue inducements (Dickert & Grady, 1999) that alter decision-making processes, such that the side-effects of participating are not fully considered (Dickert, Emanuel & Grady, 2002), or risks are overlooked (Grant & Sugarman, 2004; London, 2005). These concerns are largely hypothetical with the evidence about how participation payments influence perceived risk and decision-making processes being scare. The few studies that have been conducted in the area suggest that compensation does not lead people to neglect research risks (Bentley & Thacker, 2004; Dunn, Kim, Fellows et al., 2009; Halpern, Karlawish, Casarett et al., 2004; Singer & Couper, 2008). Specifically, it has been found that people make rational trade-offs between risk and benefit. Although they are willing to accept more risk in return for more money, this does not blind them to risk or distort their judgments (Bentley & Thacker, 2004; Dunn et al., 2009; Halpern et al., 2004; Halpern et al., 2010; Singer & Couper, 2008). On the contrary, participation payments could signal risk and increase vigilance and information seeking when the amount offered is high. (Cryder, John London, Volpp et al., 2010).

Although the above findings highlight some of the potential effects of financial incentives on the processing of risk-related information, certain limitations associated with the design of the studies, including failure to incorporate conditions of no payment

and lack of measures assessing individuals' knowledge of risks, do not allow firm conclusions to be drawn.

The effectiveness of incentives and the possible confounding variables

Financial incentive schemes are rarely comprised of only one behaviour change technique i.e. the use of rewards, but rather of a combination of techniques. For example, they usually involve agreeing on a contract, which specifies the conditions of exchange between behaviour and money encompassed in their use (Johnston & Sniehotta, 2010). Furthermore, the provision of incentives requires contact between health professionals, who measure achievement of the target behaviour, and patients (Johnston & Sniehotta, 2010). It also requires frequent monitoring of the behaviour, which is often accompanied by provision of related feedback. Although incentives schemes are hypothesised to work by linking the target behaviour to a positively evaluated stimulus, unless they are evaluated against control groups subjected to the exact same procedures as the intervention group, apart from the provision of incentives, it is not possible to infer whether their effectiveness can be attributed to the incentives *per se* or to indirect influences, mediated by changes to some aspects of the process involved in their delivery. In line with this, Hagger et al. (2013) have recently highlighted the possibility that the impact of incentives in one the few studies showing their effectiveness in achieving sustained behaviour change (Volpp et al., 2009) could be confounded by additional intervention components not included in the control group. Indeed the content of active control groups has been argued as being critical to assessing intervention effectiveness (Abraham, 2011; de Bruin, Viechtbauer, Schaalma et al., 2010).

For example, without appropriate control groups and given the procedures usually involved in delivery of incentives, it would not be possible to dismiss the possibility of incentives schemes operating by increasing health professionals' engagement with patients or through the additional involvement required on behalf of the latter, such as attending clinics or undergoing particular tests, as part of assessing eligibility for a reward. Indeed the importance of frequent contact has been demonstrated by one review which found that interventions including more frequent contact with participants achieved higher levels of weight-loss. (Dombrowski et al., 2012a). Furthermore, given that behavioural contracts improve patients' adherence to health care activities, even in the absence of the exchange of money (Bosch-Capblanch, Abba, Prictor et al., 2007), it

would not be possible to assess whether incentive scheme effectiveness should be attributed to the process of contract-agreement.

Furthermore, to more precisely assess the effect of incentives, appropriate control groups should involve the provision of unconditional payments, delivered regardless of performance of the target behaviour. These would allow researchers to disentangle the impact of using payments from the conditionality component of incentives schemes and determine whether paying people is enough to produce desired effects or whether payments need to be contingent on performance of a specific behaviour (Baird, McIntosh & Özler, 2011; Baird, Garfein, McIntosh et al., 2012; Robertson, Mushati, Eaton et al., 2013).

These issues highlight the need to be cautious when assessing the effectiveness of financial incentives schemes, given that such schemes are complex behavioural interventions that might operate through one or more of various pathways.

Conclusion and next steps

Although considerable progress has been made in designing effective interventions for changing health-related behaviours, many people continue to behave in unhealthy ways. Using financial incentives might be an effective strategy for changing health-related behaviours, thus holding the potential to reduce the morbidity and premature mortality, which is associated with many preventable illnesses. Although the use of financial incentives has been shown to effectively evoke behaviour-change in some situations, uncertainty remains about several aspects of the evidence regarding the impact of this intervention. First, there is a need to determine the conditions under which change is sustained after the intervention is discontinued. Second, the factors that might modify behavioural responses to incentives require clarification, including the exact role of incentive amount and type and recipients' level of social and material deprivation. Third, given that financial incentives schemes are complex behavioural interventions consisting of many components, there is a need to explore the possible confounding variables that might influence the impact of incentives on health-related behaviours. Finally, there is a need to empirically assess the validity of existing concerns regarding the potentially adverse consequences of financial incentives for changing health related behaviours on the quality of people's decisions to engage in incentivised behaviours and

their ability to processes risk-relevant information. The present thesis aims to address these issues through a series of four studies.

Study 1 is a systematic review and meta-analysis of trials assessing the impact of financial incentives on smoking cessation, healthier eating, including reduced alcohol consumption and increased physical activity. By synthesising the evidence across various behaviours and including information about incentive value and type and recipients' level of deprivation in the analyses, this study aims to assess the modifying role of these variables and thus determine the conditions under which financial incentives lead to sustained effectiveness. This study further aims to assess whether effectiveness is affected by the existence of possible confounding variables, by including information regarding trials' level of standardisation of study procedures between incentivised and control groups in the analyses.

Study 2 is a qualitative study describing and comparing the stop-smoking experiences of pregnant smokers' who were incentivised for smoking cessation and of those who were not. Its aim is to further explore the possible confounding variables that might influence the impact of incentives schemes on health-related behaviours.

Study 3 is a randomised controlled trial which assesses the effectiveness of financial incentives for increasing uptake of the HPV vaccinations. This study also examines the role of recipients' level of social and material deprivation in modifying behavioural responses to incentives. Furthermore, it assesses the impact of financial incentives on the quality of people's decisions to engage in incentivised behaviours

Finally, Study 4 is web-based experiment examining the potentially adverse effects of incentives on the quality of people's decision, by assessing their impact on the processing of risk-relevant information in the context of offering an incentive to engage in a behaviour with potential negative side-effects.

The next chapter

The following chapter presents the protocol for Study 1, the systematic review and meta-analysis assessing the impact of financial incentives across repeated health-related behaviours and the role of potential effect modifiers.

Chapter 3

Personal financial incentives for changing repeated health-related behaviours: protocol for a systematic review and meta-analysis.

Abstract

Background: Smoking, unhealthy eating, including the excessive consumption of alcohol and physical inactivity lead to chronic illnesses that account for over 50% of preventable deaths worldwide. Financial incentive schemes could be used to change these behaviours, but uncertainty remains regarding their potential to achieve sustained changes.

Objectives: This review aims to estimate: i. the effectiveness of financial incentives in achieving sustained change for: smoking cessation, healthier eating, including reduced alcohol consumption and increased physical activity; ii. whether effectiveness is modified by (a) the target behaviour, (b) incentive value and type and (c) recipients' deprivation level

Data Sources: We will search multiple electronic databases, including MEDLINE, EMBASE, PsycINFO, CINAHL, SCOPUS, EconLit, CENTRAL, and the Cochrane Database of Systematic Reviews, references of relevant papers and the "grey" literature.

Study Selection: We will include randomised controlled trials which allocate adults to the offer of financial incentives or a control group and include outcomes relating to the pre-specified behaviours assessed at a minimum of six months from intervention start.

Data extraction and synthesis: To generate an overall estimate of behaviour-change, dichotomous data will be extracted. If unavailable, continuous data will extracted and dichotomised. Financial incentives will be classified according to their value ('high' vs. 'low') and type ('certain' vs. 'uncertain') and participants according to their deprivation level ('high' vs. 'other'). Analyses will include meta-analyses and meta-regressions grouped by timed endpoints. Pooled effect sizes will be calculated with 95% confidence intervals using random effects models.

Conclusions: Results will inform discussions regarding the potential role of financial incentives in reducing the burden of non-communicable diseases and health inequalities.

Eleni Mantzari, Florian Vogt, Ian Shemilt, Yinghui Wei, Julian Higgins, Theresa Marteau (2012). Personal financial incentives for changing habitual health-related behaviours: a systematic review and meta-analysis. *PROSPERO* CRD42012002675 www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42012002675 (*Appendix 3.1*)

Condition or domain being studied

Poor repeated health-related behaviours, including tobacco smoking (Batty et al., 2008; Teo et al., 2006), poor diet-related behaviours (including the harmful use of alcohol) (Cox et al., 2000; He et al., 2007; Heidemann et al., 2008) and lack of physical activity (Andersen et al., 2000; Batty et al., 2001), contribute greatly to the development of major risk factors for non-communicable diseases (NCDs). These diseases, which include cardiovascular diseases, type 2 diabetes, certain types of cancers and chronic respiratory diseases, together account for more than 50% of preventable deaths worldwide (3four50.com; WHO, 2011). The morbidity and mortality burden of NCDs affects people in all age groups, imposing large, increasing and avoidable costs in human, social and economic terms (Beaglehole et al., 2011; WHO, 2011).

The prevalence of NCD-related risk factors, such as obesity, hypertension, raised blood glucose and cholesterol, as well as the physiological or metabolic consequences of tobacco smoking, can be reduced by changing individuals' and populations' health-related habits, so as to promote certain healthy behaviours, including smoking cessation, physical activity and healthier eating (including the responsible consumption of alcohol). Achieving this could in turn reduce the prevalence and burden of NCDs (Katz, O'Connell, Yeh et al., 2005).

Modifying repeated health-related behaviours, however, is difficult. Although many people report that they want to change their behaviour to improve their health, most find it difficult to implement and maintain the necessary changes (Ogden et al., 2007; Sutton, 1998). One possible way to improve individuals' health-related behaviours is through the use of personal financial incentives. Personal financial incentives are increasingly being considered and applied in health policies around the world in an attempt to promote health-enhancing behaviours (Lagarde et al., 2007; Le Grand, 2008). Several aspects of the effectiveness of personal financial incentives to promote health-related behaviours, however, remain unclear (Marteau et al., 2009). For example, although there is evidence that they can be effective in promoting one-off health-related behaviours, such as attendance at clinic appointments, uptake of immunisations, mammography screening and tuberculosis screening, and adherence to healthcare treatments (Sutherland et al., 2008), the currently limited evidence base indicates that the impact of such incentives on repeated health-related behaviours, such as smoking-,

diet- and physical activity-related behaviours, is less straightforward (Sutherland et al., 2008). Furthermore, evidence for the sustained effectiveness of personal financial incentives beyond the period of intervention remains to be established (Marteau et al., 2009).

When using financial incentives to improve repeated health-related behaviours the concern has been not only that they may not lead to sustained changes (Jochelson, 2007; Kane, Johnson, Town et al., 2004; Sutherland et al., 2008) but also that they may undermine intrinsic motivation, making it less likely than before incentivisation that the target behaviour is performed after the incentives are discontinued (Deci et al., 1999). According to Cognitive Evaluation Theory (Deci & Ryan, 1985) this is likely to occur in situations where incentives are perceived as controlling behaviour. The theory further predicts that if incentives engender feelings of competence, and therefore confirm an individual's autonomy, they might actually enhance intrinsic motivation. The extent to which these phenomena occur in the context of health-related behaviours has been questioned (Promberger & Marteau, 2013). Reviews focused on trials on smoking cessation (Cahill & Perera, 2011) and weight loss (Paul-Ebhohimhen & Avenell, 2008) have found no evidence to indicate that individuals who have been incentivised are less likely than non-incentivised individuals to engage in healthy behaviours after incentives cease. The results of such trials however, have not been systematically assembled, critically appraised or synthesised in such a way that would allow for more definitive conclusions to be drawn.

Research is needed which will synthesise the available evidence across various repeated health-related behaviours, in order to establish the exact conditions under which incentives are effective in changing such behaviours, i.e. to determine which types of personal financial incentives, for which participants and which behaviours (or related outcomes) result in greatest changes. Furthermore there is a need to determine whether these behaviour changes are:

(a) sustained after the incentive is discontinued;
(b) maintained for the duration incentives are offered but undermine intrinsic motivation, making it less likely than before incentivisation that people engage in the healthy behaviour after the incentive is discontinued; or

(c) maintained only for the duration incentives are offered with the behaviour returning to baseline levels after they are discontinued.

There is also a need to elucidate the circumstances under which each possibility might occur.

This review will address these gaps in the literature by focusing on the use of incentives for changing poor repeated health-related behaviours, i.e. tobacco smoking, physical inactivity, and unhealthy eating, including the harmful drinking of alcohol, and for promoting healthier repeated behaviours, i.e. smoking cessation, increased physical activity, and healthier eating, including the responsible drinking of alcohol. In addition, it will consider the impact of personal financial incentives on the proximal indicators of eating behaviour and performance of physical activity (body weight, body mass, blood glucose, blood cholesterol, blood lipids) (i.e. major, modifiable physiological or metabolic risk factors for NCDs). It will also attempt to determine the variables that modify the effect of financial incentives on repeated health-related behaviours.

Although various existing reviews have examined the use of incentives for changing health-related behaviour, no single review has focused explicitly on repeated health-related behaviours and has asked the same questions as those proposed in this review. Although the proposed review has some overlap with existing reviews in terms of the included studies, it will differ through the inclusion of further trials and the analysis of variables which hitherto have remained unexamined. By building upon existing reviews it will endeavour to produce a more complete and comprehensive picture of the impact of personal financial incentives allowing generalisations across repeated health-behaviours, both about the impact and the modifiers of such impact *(See Appendix 3.2 for a list of existing reviews assessing the impact of financial incentives on repeated health-related behaviours and an analysis of how the current review differs from these)*

Review questions

The objectives of this review are:

a) to assess the impact of personal financial incentives, six or more months after recruitment into an incentive scheme, on the performance of repeated health-related behaviours:

1. regardless of whether the incentive is still being offered at that time-point,
2. when the incentive has been discontinued for at least one month.

b) to assess the extent to which the impacts reported in (a.1) and (a.2) are modified by:

1. behaviour type (smoking related vs. eating-related vs. physical activity-related),
2. incentive scheme characteristics (value of the incentive and whether attainment is certain vs. uncertain)
3. participant characteristics (level of social and material deprivation),
4. study characteristics (level of risk of bias relating to the standardization of study procedures across groups and the reliability of the outcome measures).

c) to assess the impact of personal financial incentives on motivation (intrinsic vs. extrinsic) to sustain outcomes after the incentive has been discontinued.

Searches

Electronic searches

We will conduct computerised searches of the following databases:

• MEDLINE (Ovid SP) (1948 to present)
• EMBASE (Ovid SP) (1974 to present)
• PsycINFO (Ovid SP) (1806 to present)
• CINAHL (EBSCO Host) (1981 to present)
• Cochrane Database of Systematic Reviews (The Cochrane Library) (1991 to present)
• Cochrane Central Register of Controlled Trials (CENTRAL), The Cochrane Library (1991 to present)
• SCOPUS (Elsevier) (1996 to present)
• Database of Abstracts of Reviews of Effects (The Cochrane Library) (1994 to present)
• Econlit (EBSCO) (1977 to present)

We will limit searches to studies of adults (18+ years of age). We will not apply restrictions with regard to the language of publication.

Searching other resources

In order to identify relevant ongoing and unpublished studies (e.g. dissertations, conference proceedings, working papers etc.) we will search the following resources:

• HMIC (Ovid) (1983-present)
• Online clinical trials registers
    o www.controlled-trials.com/mrct/ for UK trials
    o clinicaltrials.gov/ct2/search for US trials
• Google Scholar (using basic keywords such as "financial incentives" "smoking cessation", "physical activity", "weight-loss"; the first 1000 references will be scanned)
• Websites of key organisations in the area of health and incentives for health promotion
    o Center for Health Incentives and Behavioral Economics (http://chibe.upenn.edu/)
    o Healthy Incentives (www.healthyincentives.org.uk/)
    o Weight Wins (www.weightwins.co.uk/)
    o Departments of Health for England, Scotland, Wales and Northern Ireland
    o Australian Federal and States Departments of Health
    o The World Health Organisation

- United States Department of Health

In addition, we will search reference lists of eligible articles and contact key researchers and authors to identify further potentially eligible published, unpublished or ongoing studies.

Types of study to be included

We will include randomised controlled trials and cluster randomised controlled trials, which assess the impact of personal financial incentives on repeated health-related behaviours (smoking cessation, healthier eating, including reduced alcohol consumption and increased physical activity), and/or the proximal direct consequences of such behaviours. At least one comparison group in the trials must have been randomised to receive personal financial incentives and compared to either groups not receiving financial incentives and/or groups receiving financial incentives that differ in type and/or amount. Trials must have measured outcomes up to at least 6 months from the start of the intervention.

We will exclude all studies other than randomised controlled trials to minimise the risk of bias. We will only include studies with a minimum follow-up of 6 months because we are interested in the sustainability of repeated health-behaviours. Performance of the target behaviour at six months from the beginning of the intervention is the gold standard for smoking cessation (Hughes, Keely, Niaura et al., 2003). We are applying this criterion to the other target behaviours and outcomes for reasons of standardisation and comparability. We will include studies with multiple comparison groups in which participants are offered personal financial incentives that differ in specific characteristics, such as type and/or monetary value. We will include studies of the effects of multi-component interventions if two or more comparison groups are exposed to interventions that differ only in the offer of personal financial incentives (or in the offer of personal financial incentives that differ in specific characteristics). However, we will exclude studies of the effects of multi-component interventions in which personal financial incentives feature as one component, but the study design precludes collection of data relating to the independent effect(s) of incentives.

Participants/ population

Adults aged 18 years or over (no restrictions for socio-economic or clinical characteristics or prognostic factors).

Given the prediction that the impact of personal financial incentives is moderated by recipients' level of social and material deprivation, (e.g. Sutherland et al., 2008), we

will classify participants at the study level as either highly social and materially deprived ("High") or not highly socially and materially deprived ("Other").

Intervention(s), exposure(s)

Interventions will consist of the offer of personal financial incentives, provided directly to patients or consumers (as opposed to health-care providers), contingent upon: smoking cessation; performance of a pre-specified level of physical or sedentary activity; achievement of a pre-specified target relating to the eating of healthier or less healthy foods and drinking of alcoholic beverages; achievement of a pre-specified calorific or nutritional target related to nutrient intake; achievement of a pre-specified level of energy expenditure; and/or achievement of a pre-specified level of weight loss.

We will exclude incentives of little or no monetary value and those of symbolic value (e.g. certificates, stickers, badges, key-rings, t-shirts, caps, hats or mugs) and incentives that are not contingent on individual performance of the target behaviour(s) or achievement of the target outcome(s) (e.g. consumer sales promotions, direct pricing, income transfer programmes, tax credits).

For the purposes of this review, we will classify personal financial incentives according to two dimensions, presented in order of expected importance:

1. the monetary value of the financial incentive (whether high or low; see 'Data Extraction'). This variable has been frequently proposed as an important modifier of the effect of financial incentives on health-related behaviour (e.g. Lussier et al., 2006; Paul-Ebhohimhen & Avenell, 2008; Sutherland et al., 2008)
2. whether attainment of the financial incentive is certain (i.e. the possibility of obtaining the incentive depends only on performance of the pre-specified target behaviour or achievement of the pre-specified target outcome) vs. uncertain (i.e. the possibility of obtaining the incentive depends both on performance of the pre-specified target behaviour or achievement of the pre-specified outcome and chance. Performance of the pre-specified target behaviour or achievement of the pre-specified target outcome entitles participants' to the possibility of winning the incentive by being entered into a draw/lottery/sweepstake/competition/contest. Actually attaining the incentive, however, depends on chance). Assessing this distinction is important, as research in related areas

suggests that participants might respond differentially to a certain vs. an uncertain incentive (e.g. Leung et al., 2002).

Comparator(s)/ control

Eligible comparison groups will be those in which participants are exposed to:

a) no treatment;

b) the same treatment as the incentivised group(s), but without the offer of a personal financial incentive; or

c) a personal financial incentive that differs from that offered to the treatment group in type (i.e. certain vs. uncertain), and/or monetary value.

Context

There will be no restrictions relating to the geographical or organisational setting(s) or context(s) in which the intervention(s) are provided.

Outcome(s)

Achievement of the desired repeated health-related behaviour or related outcome – i.e. performance of the target health behaviour or achievement of the target outcome, at least 6 months after recruitment into the personal financial incentives scheme and one month after the personal financial incentive has been discontinued, where the target behaviour or related outcome refers to that for which the incentive has been offered.

For each of the repeated health-behaviours we are considering, we are interested in the following outcomes:

Smoking cessation:

cessation (dichotomous - measured by carbon monoxide reading or cotinine test of urine, saliva or blood).

Physical activity:

• achievement of target level or frequency of physical activity (dichotomous - measured objectively, e.g. by pedometer, activity record, diary, questionnaire or scale)

Eating healthier foods:

• achievement of target amount or frequency of specified healthier food(s)/drink(s) (including alcoholic beverages) consumed (dichotomous - measured objectively, e.g. by diet record or diary, food frequency questionnaire)

Eating unhealthier foods:

• achievement of target amount or frequency of specified unhealthier food(s)/dink(s) (including alcoholic beverages) consumed (dichotomous - measured objectively, e.g. by diet record or diary, food frequency questionnaire)

Proximal direct consequences of eating behaviour and/or performance of physical or sedentary activity:

• achievement of target calorific or nutritional profile of food(s)/drink(s) consumed (dichotomous - measured objectively, e.g. based on diet record or diary, food frequency questionnaire)

• achievement of target level of energy expenditure (dichotomous - measured objectively, e.g. based on activity record, diary, questionnaire or scale)

• achievement of target level of cardio-respiratory fitness (dichotomous - measured by maximal oxygen intake VO2 max)

Risk factors for NCDs:

• achievement of target body weight/body fat distribution/body mass/related proxies (e.g. leptin, adipocytokines and other obesity or inflammatory markers), given target weight loss/fat loss/body mass/related proxies if applicable (dichotomous - measured objectively)

• achievement of target blood cholesterol level/blood lipid profile/blood glucose level (dichotomous - measured objectively)

Motivation (intrinsic vs. extrinsic) to engage in target health-related behaviour (dichotomous- measured using self-report questionnaires)

Where these outcomes are not available, we will record and dichotomise the following continuous outcomes:

Physical activity:

• amount of physical activity (continuous - measured objectively, e.g. number of minutes or steps performed)

Eating healthier/unhealthier foods:

• amount of healthy/unhealthy food(s)/drink(s) (including alcoholic beverages) consumed (continuous - measured objectively, e.g. by diet record or diary, food frequency questionnaire)

Proximal direct consequences of eating behaviour and/or performance of physical or sedentary activity:

• amount of calories from food(s)/drinks(s) consumed (continuous -measured objectively, e.g. based on diet records or diary, food frequency questionnaire)

• level of energy expenditure (continuous - measured objectively, e.g. based on activity records, diary, questionnaire or scale)

• level of cardio-respiratory fitness (continuous - measured by maximal oxygen intake VO2 max)

Risk factors for NCDs:

• level of weight loss/fat loss/body mass improvement (continuous - measured objectively)

• level of blood cholesterol/blood glucose/blood lipid (continuous - measured objectively)

Motivation (intrinsic vs. extrinsic) to engage in target health-related behaviour (continuous- measured using self-report questionnaires)

We will extract only dichotomous outcome data and present it in tables describing and summarising the results of each study. Where dichotomous data are not available, we will extract continuous outcome data and dichotomise it, by converting SMDs directly to odds ratios.

We will deal with varying time-points of assessment of the outcome by creating time-assessment categories. These will begin at six months after recruitment into an incentive scheme and will consist of six month intervals (i.e. 6 months, 6-12 months, 12-18

months, 18-24 months etc. since recruitment). We will also create time-assessment categories for after removal of the incentive. These will consist of one month intervals between 1 and 3 months, a three month interval between 3 and 6 months and six month intervals thereafter (i.e. 1-2 months 2-3 months, 3-6 months, 6-12 months, 12-18 months, etc. after discontinuation of incentives). We will calculate odds ratios for outcomes.

The extraction and (where necessary and possible) conversion of outcome data into dichotomous measures is intended to allow an overall estimate of behaviour change across the three sets of target behaviours.

Data extraction, (selection and coding)

Two authors (EM and FV) will independently extract all data. If outcome data are unavailable or are not presented in the published full-text reports of individual studies in the forms pre-specified in 'Outcome(s)' section (i.e. dichotomous data), or we cannot converted them to the necessary format, we will contact study authors with a request to provide these data. The first author (EM) will reconcile the two sets of independently completed data extraction forms. If there are inconsistencies between the two sets, we will re-check extracted data and verify them against the corresponding full-text study report. If uncertainly remains, the two data extractors will meet to discuss and reach a consensus. If consensus cannot be reached a final decision will be made following discussion with a third author (IS).

To allow for assessment of the role of the pre-specified moderating variables (i.e. incentive scheme characteristics (incentive value and certainty) and participants' level of social and material deprivation), during the data extraction process we will categorise incentives and their recipients at the study level. Specifically, we will classify incentives according to:

a) their value i.e. low (<$400) vs. high (≥ $400).

We will make judgements of "High value" if the total value of incentives is larger than the minimum weekly income required to be earned per household for individuals to be above the USA poverty threshold. We have chosen to follow USA guidelines because currently the majority of research in this field has been conducted in this country. The average number of family members per household in the USA is three (rounded off to the nearest figure) (United States Census Bureau, 2011) with the equivalent poverty threshold set at approximately $18530 annually ($386 weekly) per household (US Department of Health & Human Services, 2011). Based on this, we will classify the value of incentives worth $400 (total value) and above as "high" and those worth $400 (total value) and below as "low".

b) their type, i.e. certain (all incentives, such as cash, deposits, gifts, vouchers etc., excluding lotteries) vs. uncertain (i.e. lotteries)

We will collect information on participants' level of social and material deprivation and make judgements based on any relevant information that is available in the included studies (e.g. income, employment, education, ethnicity, SES scores). We will aggregate this information to allow studies to be categorised as either highly social and materially deprived ("High") or not highly socially and materially deprived ("Other"). We have chosen this categorisation because our primary interest is to determine whether incentives are more effective for the most deprived, rather than to assess the level of effectiveness associated with each level of deprivation. We will make categorisations at the study level to allow between-studies comparisons.

We will make judgements of "High deprivation" when any or all of the following conditions are met:

1. Majority of study participants have not completed high school or the mean number of years in education is less than 12 years
2. Majority of study participants earn less than $ 20,000/year ($1,666/month), or the mean reported income is less than $20,000/year or the majority of participants are allocated to the lowest income category
3. Majority of study participants are unemployed or in unskilled, semi-skilled, skilled, or blue collar jobs
4. Majority of participants have a low SES score or the mean SES score is low. Decisions about whether SES scores are indicative of high deprivation will be made by referring to the scoring of the scale used and any related instructions for interpreting these scores.
5. Majority of study participants are non-White. This information will be used when income, education, occupation and SES have not been measured, or when the information provided by these variables does not allow for definite categorisations (e.g. income is low but education is borderline, such as just above 12 years). Judgments of high deprivation based on these variables will not be affected if the sample is predominantly white.
6. Majority of study participants are underinsured or lacking insurance, receiving Medicaid, or attending public clinics or Women Infant and Children (WIC) programmes.
7. Majority of study participants are living in an area of deprivation, or receiving welfare benefits.

If the information provided by two variables is contradictory, e.g. income is low but education is high, then we will take into account the information provided by a third variable, such as occupation or ethnicity, to make a judgment. If no relevant information is reported in the paper, then we will contact authors and enquire about the availability of relevant data.

Risk of bias (quality) assessment

We will assess risk of bias of included studies at the outcome level. For both randomised controlled trials and cluster randomised trials, we will assess risk of bias by applying of the Cochrane Collaboration risk of bias tool (Higgins, Altman, Gøtzsche et al., 2011). We will assess the risk of bias for the following domains

Selection bias:

1. Random sequence generation

2. Allocation concealment

Performance bias:

1. Blinding of participants and personnel

We do not expect knowledge of intervention allocation by participants to lead to performance bias. In fact, blinding of participants is usually not relevant in studies assessing the impact of financial incentives on health-related behaviours. For the intervention to work, participants need to be aware of their entitlement to incentives, so that they can perform the necessary behaviour/achieve the outcome necessary for their attainment. Consequently, we will not consider studies in which participants were not blinded to be at high risk of bias. We will make risk of bias judgements regarding blinding of personnel (and whether their knowledge of the intervention may have altered the way they interacted with participants, and has thus influenced outcomes)

2. Standardization of study procedures

A related potential source of performance bias specific to trials assessing the impact of financial incentives on health-enhancing behaviours that we will assess, is whether studies have controlled for the additional processes inherit in the delivery of the incentive, compared to regular treatment: Attainment of incentives often requires additional involvement, on behalf of both participants and personnel, in the form of frequent clinical appointment attendance, monitoring of the formers' performance etc., which may confound the impact of financial incentives, leading to an overestimation of their effectiveness. We will make judgements of low risk of bias when study procedures have ensured that all processes are standardised between groups (i.e. all participants attend an equal number of clinical appointments and their performance is monitored a comparable number of times) apart from the provision of financial incentives contingent

on performance of a target behaviour/achievement of a target outcome. A lack of such standardisation will result in judgments of high risk of bias, whereas we will make a judgement of unclear risk of bias when there is insufficient information regarding the procedures relating to the non-intervention groups. We will incorporate this risk of performance bias assessments into the analysis to determine whether the impact of financial incentives co-varies with such between-study differences.

Detection bias

1. Blinding of outcome assessment

In trials assessing the impact of financial incentives on health-related behaviours outcome assessors are often responsible for disseminating the incentives. We expect it to be often the case therefore that assessors are aware of which group a participant has been allocated to. Whether or not a lack of blinding of outcome assessment leads to bias will largely depend on the robustness/reliability of the outcome measure used in each study, and the extent to which it requires judgements on behalf of the outcome assessors.

2. Reliability of outcome measure

A related source of detection bias, the risk of which we will assess in studies included in this review, concerns the method of outcome assessment employed and the extent to which it is reliable or can be deceived. We expect easily falsifiable measurements to be deceived more by participants in conditions where delivery of the financial incentive is contingent on the outcome of the assessment, thus leading to bias. We will consider studies in which the outcome assessment relies purely on self-report measures at high risk of bias, compared to those which include an objective outcome measure, such as a biochemical indicator. For example, in the case of physical activity and healthier eating, we will consider studies at low risk of bias if they rely on biochemical indicators such as weight-loss, maximal oxygen intake, blood lipid/glucose profiles, as opposed to diaries or questionnaires. With regards to smoking cessation, we will consider studies at low risk if smoking status is measured using the Russell standard (West, Hajek, Stead et al., 2005), as opposed to relying on self-report or monitoring of carbon monoxide level. We will incorporate these risk of detection bias assessments into the analysis to determine whether the impact of financial incentives co-varies with the type of method used to assess outcomes.

Attrition bias

Incomplete outcome data

We expect that in studies assessing the impact of financial incentives on health-related behaviour, greater levels of attrition will be observed in non-incentivised groups compared to the incentivised groups. We will analyse originally dichotomous and/or dichotomised outcome data missing due to participant drop-out via intention-to treat analysis, with a conservative assumption being made that participants dropping-out have not sustained (or achieved) the target behaviour or related outcome.

Reporting bias

1. Selective outcome reporting
2. Other sources of potential bias

For cluster randomised trials we will also consider the following:

Recruitment bias

For this domain, we will make high risk of bias judgements for studies where participants were recruited into clusters after randomisation was completed. We will make low risk of bias judgements for studies where recruitment was completed before randomisation. We will make unclear risk of bias judgments for studies where there is a lack of information regarding the order of recruitment and randomisation.

Two authors will independently apply the risk of bias tool. Additionally, each author will collect and record the source of information for each risk of bias judgement (e.g. quotation or summary of information from trial report). Where judgements are based on assumptions made on the basis of information provided outside publicly available documents, this should be stated. Any inconsistencies between the two authors with respect to coding judgements or information in support of judgements will be resolved by consensus. If consensus cannot be reached a final decision will be made following discussion with a third author.

Dealing with missing data

We will dichotomise outcome data not available in dichotomous format. We will analyse originally dichotomous and/or dichotomised outcome data missing due to participant drop-out via intention-to treat analysis, with a conservative assumption being made that participants dropping-out have not sustained (or achieved) the target behaviour or related outcome. We will deal with missing statistics either by imputation or by contacting authors.

Assessment of heterogeneity

We will assess heterogeneity by visually examining the extent to which confidence intervals overlap through inspection of forest plots. Furthermore, we will calculate and report the I-squared statistic and its confidence limits and assess heterogeneity based on the recommendations by (Deeks, Higgins & Altman, 2011). We will employ random-effects models to incorporate heterogeneity among studies in meta-analyses.

Sensitivity analysis

We will not conduct formal sensitivity analyses to compare the outcome between studies at high vs. low risk of bias across all bias domains. Instead, we will include the bias domains most pertinent to studies assessing the impact of financial incentives on health-related behaviours, i.e. the risks of bias arising from a lack of standardisation of study procedures and the use of unreliable outcome measures as co-variates in our main analysis, to determine how they affect the outcome.

Strategy for data synthesis

If possible, we will combine data from cluster-randomised controlled trials and individually randomised controlled trials for the analysis. For cluster-randomised controlled trials that have not taken their design into account (i.e. have not performed statistical methods that allow analysis at the level of the individual while accounting for the clustering in the data) will perform corrected analyses where possible, if the following information can be extracted:

• the number of clusters (or groups) randomised to each intervention group; or the average (mean) size of each cluster;

• the outcome data ignoring the cluster design for the total number of individuals (for example, number or proportion of individuals with events, or means and standard deviations); and
• an estimate of the intracluster (or intraclass) correlation coefficient (ICC).

We will deal with data from studies with multiple treatment arms (i.e. in which participants have been randomised to different types of incentives) by conducting multivariate analyses, whereby we will model direct comparisons between each treatment arm and the control. In cases of multiple control groups (i.e. groups not offered treatment and groups offered the same treatment as the incentivised groups but without the offer of financial incentives) we will exclude the groups that allow for the least accurate estimation of the independent effect of financial incentives (i.e. groups not offered treatment).

We will conduct a narrative review, describing the interventions, review/study populations, review/study characteristics and the impact of financial incentives for changing the three repeated health-related behaviours of interest, namely smoking cessation, healthier eating, including reduced alcohol consumption and physical increased activity.

Our statistical analysis will consist of a meta-regression, which will incorporate multivariate analyses for multiple treatment studies (in which participants are allocated to incentivised groups differing with respect to the type and/or size of the incentive offered), using metareg (Sterne, Harbord & White, 2010)).

The analysis will involve the following stages:

Stage 1: The effect of incentives (all combined vs. control) on health-related behaviour (all combined) will be estimated through a standard meta-analysis

Stage 2: A meta-regression will be performed with behaviour type (i.e. smoking cessation, physical activity, healthier eating, weight-loss) as a covariate.

Stage 3: A meta-regression will be performed with incentive-scheme characteristics as covariates (certain vs. uncertain and value of incentive). A multivariate framework will

be used for studies with multiple treatment arms in order for direct comparisons between each treatment arm and the control to be modelled (i.e. for studies with groups A' vs. A" vs. C the multivariate framework will be used to estimate the effects of A' vs. C and A" vs. C). Interaction terms will be included to investigate the joint effects of the incentive scheme characteristics (certain vs. uncertain and value of incentive).

Stage 4: A meta-regression will be performed with participant characteristics (i.e. level of material deprivation) and risk of bias (i.e. risk of performance and detection bias) as covariates. Behaviour type and incentive scheme characteristics will be re-entered into the model if they are found to be important predictors at stages 2 and 3 respectively.

We will calculate pooled effect sizes with 95% confidence intervals using random effects models. Given that we expect effect sizes to vary between studies according to the characteristics of the studied populations and target behaviours or related outcomes, random- as opposed to fixed-effect models are, ex ante, considered likely to be more appropriate for the purposes of this review.

The next chapter

This chapter presented the protocol for Study 1, the systematic review and meta-analysis assessing the impact of financial incentives across repeated health-related behaviours and the role of potential effect modifiers. The following chapter presents the findings for Study 1.

Chapter 4

Personal financial incentives for changing repeated health-related behaviours: a systematic review and meta-analysis.

Abstract

Background: Sustained changes in health-related behaviours would reduce the huge and growing global burden of non-communicable diseases. Uncertainty remains about whether financial-incentive schemes could achieve such changes.

Objectives: This review aims to estimate: i. the effectiveness of financial incentives in achieving and sustaining behaviour change across: smoking cessation, healthier eating, including reduced alcohol consumption and physical activity; ii. whether effectiveness is modified by (a) the target behaviour, (b) incentive value and type and (c) recipients' deprivation level.

Data Sources: We searched multiple electronic databases, references of relevant papers and the "grey" literature from inception to July 2012. We screened 24265 unique articles and included 34 in the meta-analysis (0.14%), 20 assessing smoking, and three assessing physical activity. None assessed alcohol consumption or diet. Also, 11 assessing indicators of healthier eating and/or physical activity (e.g. body weight) were included.

Study Selection: We included randomised controlled trials offering adults financial incentives that assessed outcomes relating to pre-specified behaviours at a minimum of six months from intervention start.

Data extraction and synthesis: To estimate overall behaviour-change, dichotomous data were extracted. If unavailable, continuous data were extracted and dichotomised. Financial incentives were classified according to their value ('high' vs. 'low') and type ('certain' vs. 'uncertain') and participants according to deprivation level ('high' vs. 'other'). Analyses included meta-analyses and meta-regressions grouped by timed endpoints (months from intervention start: '6'; '>6-12'; >12-18; >18; months from incentive removal: '>2-3'; >3-6; '>6'). Summary effect sizes were calculated using random effects meta-analyses.

Results: Financial incentives increased behaviour-change, with effects lasting up to 18 months from intervention start (OR 1.53, 95%CI 1.05-2.23) and three months after incentive removal (OR 2.11, 95%CI 1.21-3.6.7). The target behaviour, incentive value and incentive type did not independently modify effect sizes at any time-point. An interaction between target behaviour and incentive value modified effects at '6' months

from intervention start: low-value incentives for smoking cessation decreased behaviour change (OR 1.49, 95%CI 1.12-1.98). Recipients' deprivation level modified effects at '>6-12' months from intervention start, with higher deprivation levels increasing behaviour-change (high vs. other deprivation level: OR 2.17, 95%CI 1.22-3.85), but not at other assessed time-points.

Conclusions: Financial incentives change repeated health-behaviours and may help reduce health inequalities. However, their role in reducing non-communicable disease burden is potentially limited based on current evidence that effects are not sustained beyond three months after incentive removal.

Mantzari, E., Vogt, F., Shemilt, I., Wei' Y., Higgins, J.P.T., Marteau T.M. (in submission). Personal financial incentives for changing habitual health-related behaviours: a systematic review and meta-analysis. *The Lancet.*

Background

Smoking, poor diet-related behaviours, including excessive alcohol consumption, and physical inactivity contribute to the development of major non-communicable diseases, (i.e. cardiovascular diseases, type 2 diabetes, certain types of cancers and chronic respiratory diseases (Andersen et al., 2000; Batty et al., 2008; Batty et al., 2001; Cox et al., 2000; He et al., 2007; Heidemann et al., 2008; Teo et al., 2006)), which account for more than 50% of preventable premature deaths worldwide (3four50.com; WHO, 2012). The World Health Assembly has recently pledged to reduce non-communicable diseases by 25% by 2015 (WHO, 2013). Offering individuals financial incentives for changing their health-related behaviour has the potential to contribute to this ambitious target, but uncertainty remains about the effectiveness of these schemes.

Financial incentives have been most effective in changing one-off health-related behaviours, such as undergoing vaccinations, attending screening, and adhering to healthcare treatments (Jochelson, 2007; Kane et al., 2004; Sutherland et al., 2008). When used to change repeated health-related behaviours that contribute to non-communicable diseases (smoking, diet, including excessive alcohol consumption and physical inactivity), uncertainty remains. Although there is some evidence that incentive schemes can modify such behaviours (e.g. Jochelson, 2007; Sutherland et al., 2008), the conditions under which change is achieved and sustained after the intervention is discontinued are unclear (Jochelson, 2007; Marteau et al., 2009).

Most of the existing systematic reviews that have focused on the impact of financial incentives on repeated health-related behaviours (e.g. Cahill & Perera, 2011; Jochelson, 2007; Kane et al., 2004; Paul-Ebhohimhen & Avenell, 2008; Sutherland et al., 2008; Wall, Mhurchu, Blakely et al., 2006) *(See Appendix 3.2 for a more comprehensive list of such reviews and an explanation of how they differ from the current review)* suggest that achieved changes are not sustained after financial incentives are discontinued. These, however, have assessed the impact of incentives over time from the beginning of interventions, without explicitly focusing on or systematically analysing effects after incentive removal. This distinction is important, as in some studies delivery of the final incentive has coincided with the final follow-up assessment (Donatelle, Prows, Champeau et al., 2000a; Donatelle, Prows, Champeau et al., 2000b; Gallagher, Penn, Schindler et al., 2007; Jeffery, Hellerstedt & Schmid, 1990; Klesges, Glasgow, Klesges

et al., 1987; Rand, Stitzer, Bigelow et al., 1989). Furthermore, apart from a few exceptions (e.g. Paul-Ebhohimhen & Avenell, 2008), most existing reviews have not systematically analysed the factors that modify behavioural responses to incentives. Such factors include the behaviour targeted (Jochelson, 2007; Sutherland et al., 2008), the value of the incentive (Lussier et al., 2006; Paul-Ebhohimhen & Avenell, 2008; Sutherland et al., 2008), whether incentive attainment is certain (e.g. voucher or cash payment) or uncertain (e.g. lottery ticket) (Leung et al., 2002) and recipients' level of social and material deprivation (Sutherland et al., 2008). Some evidence suggests that under the right conditions financial incentives could lead to sustained changes (Cahill & Perera, 2011; Troxel & Volpp, 2012; Volpp et al., 2009). This highlights the need for research to move beyond the question of whether incentives work, to an elucidation of the circumstances under which they are most effective (Marteau et al., 2009). An improved understanding of the role of potential effect modifiers is needed to inform the design of optimal personal financial incentive schemes.

The present review aims to produce a more comprehensive picture of the impact of personal financial incentives on repeated health-related behaviours by aiming to estimate:

a. the effectiveness of financial incentive schemes in achieving change across repeated health-behaviours: smoking cessation, healthier eating, including reduced alcohol consumption, and physical activity
    i. regardless of whether the incentive is still offered
    ii. when the incentive has been discontinued

b. the extent to which the effectiveness of financial incentives schemes is modified by:
    i. the target behaviour (smoking-related vs. eating and alcohol consumption-related vs. physical activity-related)
    ii. the value and type (i.e. certain vs. uncertain) of the incentive
    iii. recipients' levels of social and material deprivation

Methods

Further information on the study methods are presented in the systematic review protocol, details of which were registered on PROSPERO www.crd.york.ac.uk/prospero/display_record.asp?ID=CRD42012002675.

Study inclusion criteria

We included randomised controlled trials (RCTs), including cluster randomised controlled trials (cluster-RCTs), assessing the impact of personal financial incentives on repeated health-related behaviours (smoking cessation, healthier eating, including reduced alcohol consumption and increased physical activity), and/or the proximal direct consequences of such behaviours, in adults aged 18 years and over. No other restrictions were applied with regards to the participants of included studies. At least one comparison group in included studies had to have been randomised to receive personal financial incentives and compared either to i) groups not receiving treatment; ii) groups receiving the same treatment as the incentivised groups, but without the offer of a financial incentive; and/or iii) groups receiving financial incentives that differed in type (certain vs. uncertain) and/or amount. Studies had to have measured outcomes relating to the pre-specified health-related behaviours at a minimum of 6 months from the start of interventions, to allow for assessment of the sustainability of behavioural changes. Studies of the effects of multi-component interventions were included if two or more comparison groups were exposed to interventions that differed only in the offer of personal financial incentives (or in the offer of incentives that differed in specific characteristics). However, studies of the effects of multi-component interventions in which personal financial incentives featured as one component, but the study design precluded assessment of the independent effects of incentives, were excluded. Studies offering incentives of little or no monetary value and those of symbolic value (e.g. certificates, stickers, badges, key-rings, t-shirts, caps, hats or mugs) and incentives that were not contingent on achievement of the target outcome (e.g. consumer sales promotions, direct pricing, income transfer programmes, tax credits) were excluded. No restrictions were imposed relating to the geographical or organisational settings or contexts in which the interventions were provided.

Literature searches

We used a detailed strategy (*Appendix 4.1*) to search the following databases for published articles from inception to July 2012: MEDLINE, EMBASE, PsycINFO, CINAHL, SCOPUS, EconLit, CENTRAL and the Cochrane Database of Systematic Reviews. Searches were limited to studies of adults (18+ years of age). No restrictions were applied with regards to the language or date of publication. We also searched the reference lists of existing relevant reviews and eligible articles, to identify further potentially eligible studies. To identify relevant ongoing and unpublished studies, we searched HMIC, online clinical trials registers, Google Scholar and websites of key organisations in the area of health and incentives for health promotion.

Study selection and data extraction

The titles and abstracts of all records of study reports were screened by one author (EM). The full-text reports of potentially eligible studies were obtained for further independent assessment by one author (EM) and one trained research assistant (JT). Disagreements were resolved by consensus.

One author (EM) and one trained research assistant (LSR) independently extracted all data. The first author (EM) reconciled the two sets of completed data extraction forms. To allow for an overall estimate of behaviour change across the three sets of target behaviours, dichotomous data were extracted, as measures of effectiveness in terms of the attainment or non-attainment of a pre-specified target level of behaviour change. If outcome data were unavailable, or were not presented in dichotomous form, or could not be converted to the necessary format, study authors were contacted with a request to provide these data. Relevant existing systematic reviews (e.g. Cahill & Perera, 2011; Paul-Ebhohimhen & Avenell, 2008) were also checked for availability of such data. Where dichotomous data were not available, continuous outcome data were extracted and results later re-expressed as odds ratios (see Data analysis).

To allow for assessment of the role of the pre-specified moderating variables (incentive value and certainty and participants' level of social and material deprivation), during the data extraction process incentives were classified according to their value as either 'low' (<$400) or 'high' (≥ $400). Judgments regarding the classification of value in the only study included in the review, which was conducted in a low income country (Giné, Karlan & Zinman, 2010), were made based on information reported by the study

authors that incentives constituted approximately 20% of participants' monthly income. Checks conducted using the http://www.usinflationcalculator.com/ website confirmed that the classification of value of all studies included in the analyses remained the same when taking inflation into account. Incentives were also classified according to their type as either 'certain' (all incentives, such as cash, deposits, gifts, vouchers etc., excluding lotteries) or 'uncertain' (i.e. lotteries). Participants' level of social and material deprivation was classified at the study level as either 'high' or 'other' based on any relevant information that was available in the included study reports (e.g. income, employment, education, ethnicity, SES scores). (For the specific criteria used to make these classifications refer to the review protocol in Chapter 3). If no relevant information was reported in the papers to allow these classifications to be made, study authors were contacted with a request to provide relevant data.

Assessment of methodological quality of included studies

One author (EM) and one trained research assistant (LSR) independently assessed the risk of bias of included RCTs and cluster-RCTs, by applying the Cochrane Collaboration risk of bias tool (Higgins et al., 2011). Judgements of low, high and unclear risk of bias were made for each domain, following the definitions and criteria provided in *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins et al., 2011). Inconsistencies with respect to coding judgements were resolved by consensus. When judging the risk of performance bias, in addition to the domain specified by the Cochrane tool, the level of standardisation of study procedures between groups (i.e. whether studies had controlled for the additional processes inherit in the delivery of the incentive, compared to regular treatment) was also assessed. When judging the risk of detection bias, the reliability of the outcome measures used in each study (i.e. whether outcome assessors could have be deceived by study participants) was also assessed. For cluster-randomised controlled trials, the potential risk of bias resulting from recruitment of participants after the randomisation of clusters was completed was considered.

Data analysis

Dichotomous outcome data were analysed by calculating an odds ratio (OR) for each study as effect size, along with a 95% confidence interval. When dichotomous data were not available, but continuous outcome data were, a standardized mean difference (SMD) was calculated and converted to an odds ratio on the basis of a logistic distributional assumption for the continuous outcome (Anzures-Cabrera, Sarpatwari &

Higgins, 2011). Specifically, the approximate log (OR) was obtained as $\text{SMD} \times \pi / \sqrt{3}$. Outcomes assessed at various time-points were analysed separately based on pre-specified time-assessment intervals and the availability of data corresponding to each of these. The time-assessment categories used were: months from intervention start: 6, >6-12, >12-18, >18; months from incentive removal: >2-3, >3-6, >6. Missing standard deviations of change in body weight were calculated using the formula proposed by Avenell, Broom, Brown et al. (2004) (SD of weight change = 5.915 + (0.283 x absolute value of mean change in weight)).

Heterogeneity was assessed via examination of forest plots and calculation of the I-squared statistic. Data were synthesized via meta-analyses grouped by timed endpoints. Univariable and multivariable meta-regressions were conducted to assess the effect of moderating variables on log (OR). These were implemented for outcomes relating to 6 and >6-12 months from intervention start, and >2-3 and >6 months from incentive removal. They were not implemented for outcomes relating to other endpoints due to insufficient statistical power. Moderating variables investigated were behaviour type, incentive value, incentive attainment certainty, recipients' level of deprivation, judgement of potential bias relating to standardisation of study procedures, and judgement of potential bias related to the reliability of outcome measurements. Two-way interactions were examined between pairs of effect modifiers. All meta-regression analyses were conducted using xi:metareg in Stata (Harbord & Higgins, 2008). Summary effect sizes were calculated and their 95% confidence intervals were computed using random-effects meta-analysis models.

Results

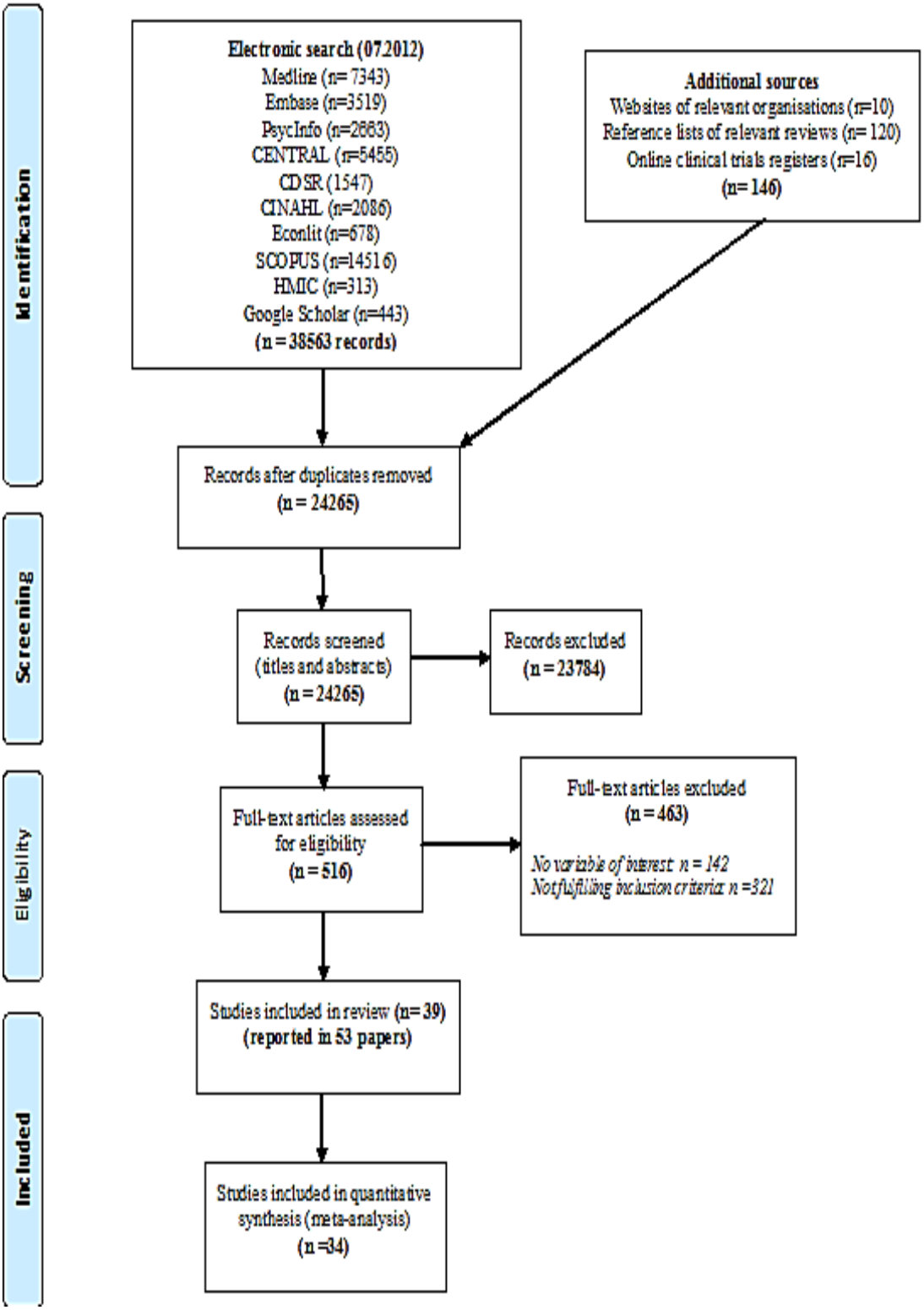
The flow of records and studies through the systematic review process is presented in Figure 4.1. Of the 38730 publications identified, 516 were retrieved for full-text assessment. Thirty-nine studies (n=39) reported in 53 articles met criteria for inclusion in the review (*Appendix 4.2*), 34 of which were used for the analyses (Figure 4.1). One study (Francisco, Paine, Fawcett et al., 1994) was excluded from the analyses because outcome dispersion was reported in the form of ranges, which are unstable for the estimation of standard errors needed for the analyses. Another (Jeffrey, 1983) was excluded because the two incentivised groups included in this study did not differ on any key variables (value and/or certainty of attainment) and there was no control group to which a possible combination of the two could be compared. Two more (Mahoney, 1974; Norton & Powers, 1980) were excluded because data relating to assessments at a minimum of 6-months from intervention start were not reported. A final study (Wing, Epstein, Marcus et al., 1981) was not included in the analyses because a crossover method was employed in the delivery of incentives and there was no control group to which a possible combination of the two crossover treatment groups could be compared.

Description of included studies

The characteristics of studies included in the review are presented in *Appendix 4.3*. Seven studies (n=7) were cluster-randomised control trials (Galbo, 2011; Giné et al., 2010; Glasgow, Hollis, Ary et al., 1993; Gomel, Oldenburg, Simpson et al., 1993; Hennrikus, Jeffery, Lando et al., 2002; Jason, Salina, McMahon et al., 1997; Klesges et al., 1987). The great majority (n=36) were conducted in the USA. One was conducted in the Philippines (Giné et al., 2010), one in Australia (Gomel et al., 1993) and one in Northern Ireland (Hunter, 2011). Twelve were carried out within workplaces (Bloch, Armstrong, Dettling et al., 2006; Francisco et al., 1994; Galbo, 2011; Glasgow et al., 1993; Gomel et al., 1993; Hennrikus et al., 2002; Hunter, 2011; Jason et al., 1997; Klesges et al., 1987; Rand et al., 1989; Volpp et al., 2009; Windsor, Lowe & Bartlett, 1988), 15 within the community (Giné et al., 2010; Jeffery, Bjornson-Benson, Rosenthal et al., 1984; Jeffery et al., 1990; Jeffery, Wing, Thorson et al., 1998; Jeffery, Wing, Thorson et al., 1993; Jeffrey, 1983; John, Norton, Fassbender et al., 2011; Klem & Klesges, 1988; Kramer, Jeffery, Snell et al., 1986; Mahoney, 1974; Norton & Powers, 1980; Saccone & Israel, 1978; Volpp, John, Troxel et al., 2008a; Wing et al., 1981; Wing, Jeffery, Pronk et al., 1996), 11 in medical/health settings (Crowley,

Macdonald & Walter, 1995; Donatelle & Hudson, 2002; Donatelle et al., 2000a; Donatelle et al., 2000b; Gallagher et al., 2007; Heil et al., 2008; Higgins, Heil, Solomon et al., 2004; Higgins, Washio, Heil et al., 2012; Long, Jahnle, Richardson et al., 2012; Shoptaw, Rotheram-Fuller, Yang et al., 2002; Volpp, Levy, Asch et al., 2006) and one in an academic setting (Tevyaw, Colby, Tidey et al., 2009).

Figure 4.1. PRISMA flow diagramme (Moher, Liberati, Tetzlaff et al., 2009)



Target behaviours

The majority of studies (n=19) focused on smoking cessation (Crowley et al., 1995; Donatelle & Hudson, 2002; Donatelle et al., 2000a; Donatelle et al., 2000b; Gallagher et al., 2007; Giné et al., 2010; Glasgow et al., 1993; Heil et al., 2008; Hennrikus et al., 2002; Higgins et al., 2004; Higgins et al., 2012; Jason et al., 1997; Klesges et al., 1987; Rand et al., 1989; Shoptaw et al., 2002; Tevyaw et al., 2009; Volpp et al., 2006; Volpp et al., 2009; Windsor et al., 1988), 15 on indicators of healthier eating and/or physical activity (body weight cholesterol levels, haemoglobin levels) (Bloch et al., 2006; Francisco et al., 1994; Galbo, 2011; Jeffery et al., 1984; Jeffery et al., 1993; Jeffrey, 1983; John et al., 2011; Klem & Klesges, 1988; Kramer et al., 1986; Long et al., 2012; Mahoney, 1974; Norton & Powers, 1980; Saccone & Israel, 1978; Volpp et al., 2008a; Wing et al., 1981) and two on physical activity (Hunter, 2011; Wing et al., 1996). Three studies targeted more than one behaviour. Jeffery et al. (1990) targeted two different participant populations for weight-loss (indicator of healthier eating and/or physical activity) and smoking cessation respectively. Gomel et al. (1993) focused on smoking cessation, and changes to indicators of physical activity and/or healthier eating. Only data on smoking cessation were included in the analyses, as those relating to the other outcomes were not fully reported in the study report. Jeffery et al. (1998) reported outcomes relating both to physical activity and weight-loss (indicator of healthier eating and/or physical activity). No studies reporting outcomes relating to healthier eating or alcohol consumption were found eligible for inclusion in the review. None of the included studies reported outcomes relating to the impact of financial incentives on motivation to engage in the target behaviours.

Target behaviours were assessed at various time-points ranging from six months (Bloch et al., 2006; Crowley et al., 1995; Donatelle & Hudson, 2002; Donatelle et al., 2000a; Donatelle et al., 2000b; Francisco et al., 1994; Giné et al., 2010; Gomel et al., 1993; Heil et al., 2008; Higgins et al., 2004; Higgins et al., 2012; Hunter, 2011; Jason et al., 1997; Jeffery et al., 1990; Jeffery et al., 1998; Jeffery et al., 1993; Klem & Klesges, 1988; Klesges et al., 1987; Long et al., 2012; Rand et al., 1989; Shoptaw et al., 2002; Tevyaw et al., 2009; Volpp et al., 2006; Volpp et al., 2009; Windsor et al., 1988; Wing et al., 1996) to >18 months from intervention start (Glasgow et al., 1993; Hennrikus et al., 2002; Jason et al., 1997; Jeffery et al., 1993), with most studies reporting outcomes at more than one time-point. Twenty-six studies included assessments after discontinuation of the incentives (Crowley et al., 1995; Donatelle & Hudson, 2002;

Giné et al., 2010; Glasgow et al., 1993; Gomel et al., 1993; Heil et al., 2008; Hennrikus et al., 2002; Higgins et al., 2004; Higgins et al., 2012; Hunter, 2011; Jason et al., 1997; Jeffery et al., 1984; Jeffery et al., 1993; Jeffrey, 1983; John et al., 2011; Klem & Klesges, 1988; Mahoney, 1974; Norton & Powers, 1980; Saccone & Israel, 1978; Shoptaw et al., 2002; Tevyaw et al., 2009; Volpp et al., 2008a; Volpp et al., 2006; Volpp et al., 2009; Windsor et al., 1988; Wing et al., 1996). In the remainder 13 the last assessment coincided with the delivery of the final incentive (Bloch et al., 2006; Donatelle et al., 2000a; Donatelle et al., 2000b; Francisco et al., 1994; Galbo, 2011; Gallagher et al., 2007; Jeffery et al., 1990; Jeffery et al., 1998; Klesges et al., 1987; Kramer et al., 1986; Long et al., 2012; Rand et al., 1989; Wing et al., 1996).

Financial incentive schemes

The duration of the financial incentive schemes varied between studies and ranged from three weeks (Tevyaw et al., 2009) to 18 months (Hennrikus et al., 2002; Jeffery et al., 1998; Jeffery et al., 1993). In the majority of studies (n=31), financial incentives were offered in addition to other interventions for changing the target behaviours, such as counselling, advice, social support, self-help manuals, brochures, professional advice, nicotine replacement therapy. In eight studies financial incentives consisted of the only intervention (Francisco et al., 1994; Gallagher et al., 2007; Glasgow et al., 1993; Heil et al., 2008; Higgins et al., 2004; Higgins et al., 2012; Hunter, 2011; Long et al., 2012). Studies differed in the types of incentives they used. Eight rewarded behaviour change with vouchers (Donatelle & Hudson, 2002; Donatelle et al., 2000a; Donatelle et al., 2000b; Heil et al., 2008; Higgins et al., 2004; Higgins et al., 2012; Hunter, 2011; Shoptaw et al., 2002), 11 with cash payments (Jason et al., 1997; Jeffery et al., 1998; Jeffery et al., 1993; Klem & Klesges, 1988; Klesges et al., 1987; Long et al., 2012; Rand et al., 1989; Tevyaw et al., 2009; Volpp et al., 2006; Volpp et al., 2009; Windsor et al., 1988) and two with cheque payments (Bloch et al., 2006; Wing et al., 1981). Four studies used lottery tickets as the incentive (Crowley et al., 1995; Francisco et al., 1994; Hennrikus et al., 2002; Wing et al., 1996) and eight used a system of deposits refunded for behaviour change (Giné et al., 2010; Jeffery et al., 1984; Jeffery et al., 1990; Jeffrey, 1983; Kramer et al., 1986; Mahoney, 1974; Norton & Powers, 1980; Saccone & Israel, 1978). Two studies combined cash payments or vouchers with lottery prizes (Glasgow et al., 1993; Gomel et al., 1993), two combined cash payments with a deposit system (Galbo, 2011; John et al., 2011) and one included two incentivised groups, one of which was offered cash payments combined with deposits and the other lottery tickets (Volpp

et al., 2008a). Information regarding incentive type was missing from one study (Gallagher et al., 2007). With regards to their certainty of attainment, the majority of incentive schemes were classified as 'certain' (n=32). Four were classified as 'uncertain' (Crowley et al., 1995; Francisco et al., 1994; Hennrikus et al., 2002; Wing et al., 1996) and two as both 'certain and uncertain' (i.e. the same group of participants were offered cash payments or vouchers and chances to win lotteries) (Glasgow et al., 1993; Gomel et al., 1993). One study (Volpp et al., 2008a) included two incentivised groups, one which was classified as 'certain' and the other as 'uncertain'.

The value of the incentives also differed between studies and ranged from $15 to $1950 for 'certain' incentives and $11200 for 'uncertain' incentives. The value of the incentives used in 20 studies was classified as 'low' (Bloch et al., 2006; Donatelle et al., 2000b; Francisco et al., 1994; Hunter, 2011; Jason et al., 1997; Jeffery et al., 1984; Jeffery et al., 1990; Jeffrey, 1983; Klem & Klesges, 1988; Klesges et al., 1987; Kramer et al., 1986; Long et al., 2012; Mahoney, 1974; Norton & Powers, 1980; Rand et al., 1989; Saccone & Israel, 1978; Tevyaw et al., 2009; Volpp et al., 2006; Windsor et al., 1988; Wing et al., 1981) and as 'high' in 18 studies (Crowley et al., 1995; Donatelle et al., 2000a; Galbo, 2011; Gallagher et al., 2007; Giné et al., 2010; Glasgow et al., 1993; Gomel et al., 1993; Heil et al., 2008; Hennrikus et al., 2002; Higgins et al., 2004; Higgins et al., 2012; Jeffery et al., 1998; Jeffery et al., 1993; John et al., 2011; Shoptaw et al., 2002; Volpp et al., 2008a; Volpp et al., 2009; Wing et al., 1996). One study (Donatelle & Hudson, 2002) included two incentivised groups differing in their classification of value (i.e. the value of the incentive offered to one group was classified as 'low' and to the other as 'high').

Participants

The studies included a total of 12842 adults, with a mean age ranging from 19.7 to 59.6 years. The studies differed in terms of the types of populations they included. Twelve studies included employees (Bloch et al., 2006; Francisco et al., 1994; Galbo, 2011; Glasgow et al., 1993; Gomel et al., 1993; Hennrikus et al., 2002; Hunter, 2011; Jason et al., 1997; Klesges et al., 1987; Rand et al., 1989; Volpp et al., 2009; Windsor et al., 1988), 15 included members of the general public (Giné et al., 2010; Jeffery et al., 1984; Jeffery et al., 1990; Jeffery et al., 1998; Jeffery et al., 1993; Jeffrey, 1983; John et al., 2011; Klem & Klesges, 1988; Kramer et al., 1986; Mahoney, 1974; Norton & Powers, 1980; Saccone & Israel, 1978; Volpp et al., 2008a; Wing et al., 1981; Wing et al.,

1996), six included pregnant women (Donatelle & Hudson, 2002; Donatelle et al., 2000a; Donatelle et al., 2000b; Heil et al., 2008; Higgins et al., 2004; Higgins et al., 2012) one patients with COPD (Crowley et al., 1995) one mental health patients (Gallagher et al., 2007) one drug addicts (Shoptaw et al., 2002), and one university students (Tevyaw et al., 2009). Most studies (n=32) included male and female participants. In addition, however, to the six studies conducted with pregnant women, one further study included only female participants (Wing et al., 1996) and another included only men (Jeffrey, 1983). Most studies (n=38) included participants from various ethnic backgrounds. One, however, focused only on African Americans (Long et al., 2012). Participants' level of social and material deprivation was classified as 'high' in 12 studies (Crowley et al., 1995; Donatelle & Hudson, 2002; Donatelle et al., 2000a; Donatelle et al., 2000b; Gallagher et al., 2007; Giné et al., 2010; Heil et al., 2008; Higgins et al., 2004; Higgins et al., 2012; Rand et al., 1989; Shoptaw et al., 2002; Volpp et al., 2006). Five studies did not include any information to allow for a classification to be made (Klem & Klesges, 1988; Mahoney, 1974; Norton & Powers, 1980; Wing et al., 1981; Wing et al., 1996). Participants' deprivation level of the remaining 22 studies was classified as 'other'.

Quality of included studies (Figure 4.2)

Selection bias

As can be seen in Figure 4.2, only nine studies were considered to have conducted adequate randomisation procedures (Gallagher et al., 2007; Hunter, 2011; John et al., 2011; Long et al., 2012; Shoptaw et al., 2002; Volpp et al., 2008a; Volpp et al., 2006; Volpp et al., 2009; Windsor et al., 1988) with six of these considered to have also followed adequate procedures for allocation concealment (Hunter, 2011; Long et al., 2012; Volpp et al., 2008a; Volpp et al., 2006; Volpp et al., 2009; Windsor et al., 1988). Most studies provided insufficient detail for the integrity of randomisation (n=26) and allocation concealment to be assessed (n=30). The remainder did not use adequate randomisation (Crowley et al., 1995; Giné et al., 2010; Higgins et al., 2004; Jeffery et al., 1990) or allocation concealment procedures (Crowley et al., 1995; Gallagher et al., 2007; Higgins et al., 2004)

Performance bias

Because of the nature of financial incentive schemes, participants could not be blinded in any of the studies. Seven studies either reported attempts to blind personnel, or their lack of blinding was assessed to have minimal risk (i.e. the chances of personnel influencing outcomes (e.g. through encouragement) were considered to be low (Bloch et al., 2006; Donatelle & Hudson, 2002; Hennrikus et al., 2002; Hunter, 2011; Jeffery et al., 1990; Long et al., 2012; Volpp et al., 2006). Thirty studies provided insufficient detail to judge whether a lack of blinding increased the risk of bias, while in two studies the lack of blinding was considered to have potentially affected outcomes (Gallagher et al., 2007; Glasgow et al., 1993).

The majority of studies (n=29) had sufficiently standardised study procedures between incentivised and control groups, therefore diminishing the possibility that obtained outcomes were the result of the additional processes inherit in the delivery of the incentive. Ten studies failed to standardise study procedure between incentivised and control groups (Donatelle et al., 2000a; Donatelle et al., 2000b; Galbo, 2011; Gallagher et al., 2007; Giné et al., 2010; Glasgow et al., 1993; John et al., 2011; Kramer et al., 1986; Volpp et al., 2008a; Volpp et al., 2009). The impact of incentives in these studies may, therefore be confounded by other intervention components.

Detection bias

In all but one study, which was judged to be at high risk of bias (Jeffery et al., 1998; outcome relating to physical activity), outcome assessors were considered to have been adequately blinded or the risk resulting from a lack of blinding, was judged to be minimal (i.e. the method of outcome assessment did not require subjective interpretation on behalf of the assessors). Most studies (n=28) used reliable, objective measures when assessing outcomes. The measures used in seven studies were judged to have potentially resulted in detection bias (Hennrikus et al., 2002; Hunter, 2011; Jason et al., 1997; Jeffery et al., 1990; Jeffery et al., 1998; Klesges et al., 1987; Rand et al., 1989).

Risk of bias in Cluster-RCTs

Of the seven studies that were cluster randomised-controlled trials, one was judged at high risk of recruitment bias, due participants being recruited into clusters after randomisation was completed (Giné et al., 2010). The information provided in one further study was insufficient to judge its risk of recruitment bias (Gomel et al., 1993).

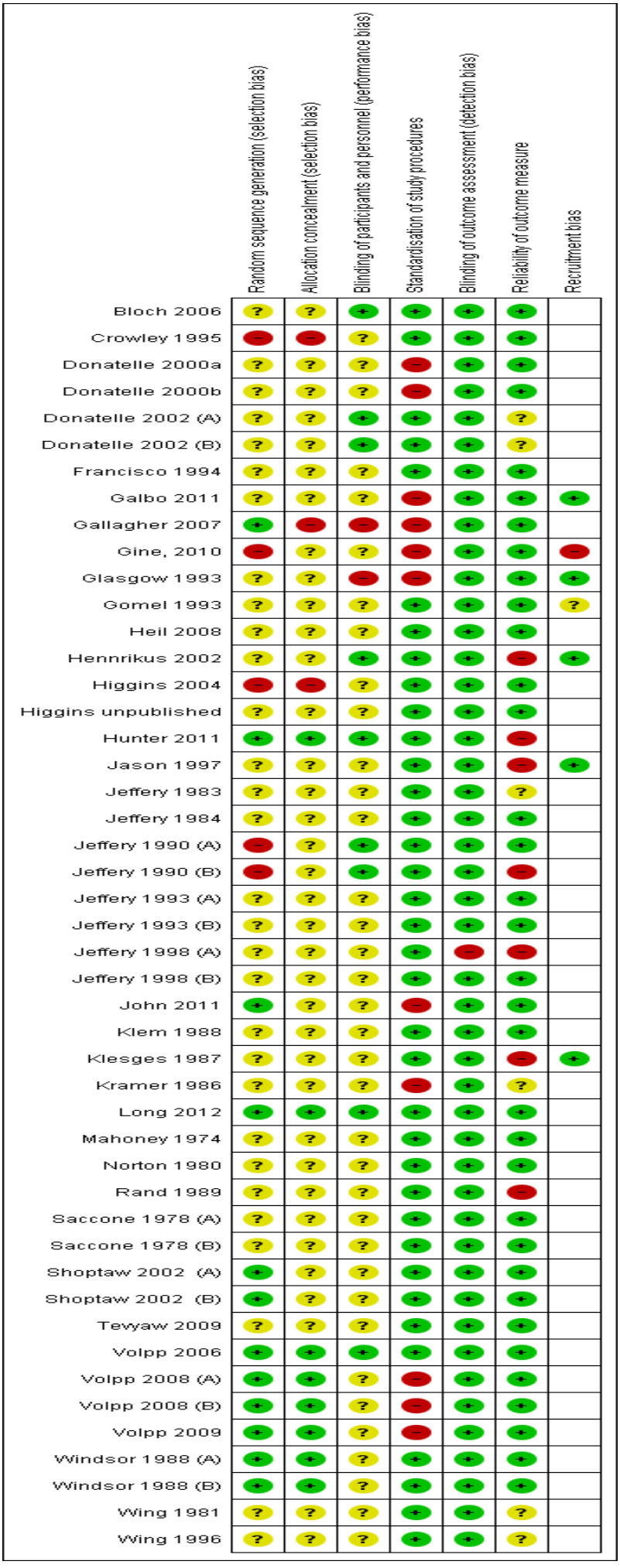


Figure 4.2. Risk of bias summary: review authors' judgements about each risk of bias item for each included study

Impact of financial incentives on repeated health-related behaviours

Thirty-four independent studies including 10585 adults were included in the analysis *(See Appendix 4.4 for study results).* The total number of comparisons across time-points and behaviours/outcomes was 112 (Table 4.1)[1]. The number of comparisons decreased over time, with only five relating to assessments beyond 18 months from intervention start (Table 4.2).

Table 4.1. Number of comparisons and participants included in the analyses for each behaviour/outcome

Behaviour type/ Outcome*	**# of comparisons**	**# participants treatment /control**
Smoking cessation	70	4500/4263
Indicators of healthier eating/physical activity	35	639/551
Physical activity	7	293/306
Total	112	5432/5120

* The majority of comparisons relate to smoking cessation. Very few relate to physical activity. None reflect alcohol consumption and healthier eating

Table 4.2 Number of comparisons at difference measurement times

Measurement time	**Number of comparisons**
6 months from start	33
>6-12 months from start	28
>12-18 months from start	13
>18 months from start	5
>2-3 months from removal	11
>3-6 months from removal	9
>6 months from removal	13

There were moderate levels of heterogeneity between studies at most time-points (6 months: I^2=39%, p=0.01; >6-12 months: I^2=66%, p=0.00; >12-18 months: I^2=54%, p=0.01; >2-3 months from incentive removal: I^2=51%, p=0.02), apart from >18 months from intervention start (I^2=0%, p=0.55) and >3-6 months (I^2=46%, p=0.06) and >6 months from incentive removal (I^2=0%, p=0.59). These levels of heterogeneity derived from moderate to substantial inconsistencies observed at these time-points in relation to the results of studies assessing smoking cessation (6months: I^2=52%, p=0.00; >6-12

[1] Eight studies (Donatelle et al 2002; Jeffery et al 1990; Jeffery et al 1993; Jeffery et al 1998; Saccone &Israel 1978; Shoptaw et al 2002; Volpp et al 2008; Windsor et al., 1988) included more than one incentivised group and appropriate control and thus offered more than one comparison at assessed time-points. These were included in the analysis as separate studies: Donatelle (A), (B); Jeffery 1990 (A), (B); Jeffery 1993 (A), (B); Jeffery 1998(A), (B); Saccone 1978(A), (B); Shoptaw 2002 (A), (B); Volpp 2008 (A), (B); Windsor 1988 (A), (B).

months: I^2= 79%, p=0.00; >12-18 months: I^2=61%, p=0.02; >18 months: I^2=0%, p=0.39; >2-3 months from incentive removal: I^2=54%, p=0.04; >3-6 months: I^2=46%, p=0.06; >6months: I^2=15%, p=0.32). Inconsistencies observed in relation to the results of studies targeting other behaviours/outcomes were judged minor (indicators of healthier eating/physical activity: 6months: I^2=0%, p=0.63; >6-12 months: I^2= 0%, p=0.98; >12-18 months: I^2=0%, p=0.75; >18 months: I^2=0%, p=0.77; >2-3 months from incentive removal: I^2=0%, p=0.60; >6 months from incentive removal: I^2=0%, p=0.66; physical activity: 6months: I^2=0%, p=0.88; >12-18 months: I^2=0%, p=0.54)

Financial incentives beneficially changed overall behaviours at 6 months (OR 1.80, CI 95% 1.37-2.32), >6-12 months (OR 1.67, 95% CI 1.13-2.45) and >12-18 months from intervention start (OR 2.69, 95% CI 1.39-5.23), but not at >18 months (OR 1.04, 95% CI 0.88-1.21) (Table 4.2; Figure 4.3). When focusing only on studies including assessments of outcomes after removal of the incentives, it was found that financial incentives were effective in sustaining changes to overall behaviour for up to >2-3 months from incentive removal (OR 2.11, 95% CI 1.21-3.6.7), but not thereafter (>3-6 months: OR 1.31, 95% CI 0.90-1.90; >6 months: OR 1.10, 95% CI 0.95-1.27) (Table 4.2; Figure 4.4).

With regards to their impact on each of the included behaviours/outcomes, financial incentives significantly increased the odds of smoking cessation at all measurement times except at >18months from intervention start (6 months: OR 1.80, 95% CI 1.37-2.37; >6-12 months: OR 1.67, 95% CI 1.13-2.45; >12-18months: OR 2.69, 95 CI 1.39-5.23; >18months: OR 1.06, 95% CI 0.90-1.25). Improved cessation rates were sustained for up to >2-3 months after incentive removal (OR 2.57, 95% CI 1.20-5.54). Beyond 3 months from removal these effects disappeared (>3-6 months: OR 1.31, 95% CI 0.90-1.90; >6 months: OR 1.16, 95% CI 0.94-1.43). Financial incentives also beneficially changed indicators of healthier eating and/or physical activity at 6 months (OR 1.66, 95% CI 1.28-2.15) and >6-12months (OR 1.39, 95% CI 1.03-1.88) from interventions start. Changes, however, were not sustained after incentive removal (>2-3 months: OR 1.99, 95% CI 0.53-7.42; >6 months: OR 1.11, 95% CI 0.76-1.63). Physical activity was measured only at 6 months and >12-18 months from intervention start and >2-3 months after incentive removal: financial incentives did not to lead to any significant improvements at any of these time-points (6 months: OR 1.29, 95% CI 0.97-1.72; >12-

18 months: OR 0.75, 95% CI 0.41-1.34; >2-3 months from incentive removal: OR 1.21, 95% CI 0.85-1.71 (Table 4.2)).

Table 4.3. Overall behaviour change (summary odds ratios with 95% CIs) and change for targeted behaviours

	Measurement time from intervention start				**Measurement time after incentive removal**		
Behaviour type /Outcome	**6 months**	**>6-12 months**	**>12-18 months**	**>18 months**	**>2-3 months**	**>3-6 months**	**>6 months**
Overall	**1.70 (1.42-2.02)** (n=33)	**1.59 (1.21-2.08)** (n=28)	**1.53 (1.05-2.23)** (n=13)	1.04 (0.88-1.21) (n=5)	**2.11 (1.21-3.67)** (n=11	1.31 (0.90-1.90) (n=9)	1.10 (0.95-1.27) (n=13)
Smoking cessation	**1.80 (1.37-2.37) (n=21)**	**1.67 (1.13-2.45) (n=17)**	**2.69 (1.39-5.23) (n=6)**	1.06 (0.90-1.25) (n=3)	**2.57 (1.20-5.54) (n=7)**	1.31 (0.90-1.90) (n=9)	1.16 (0.94-1.43) (n=7)
Healthier eating /physical activity indicators	**1.66 (1.28-2.15)** (n=8)	**1.39 (1.03-1.88)** (n=11)	1.20 (0.81-1.78) (n=5)	0.77 (0.43-1.37) (n=2)	1.99 (0.53-7.42) (n=3)	-	1.11 (0.76-1.63) (n=6)
Physical activity	1.29 (0.97-1.72) (n=4)	-	0.75 (0.41-1.34) (n=2)	-	1.21 (0.85-1.71) (n=1)	-	-

Note: n denotes number of comparisons

Figure 4.3: Study estimates of financial incentive effects on health behaviours at time-points from intervention start

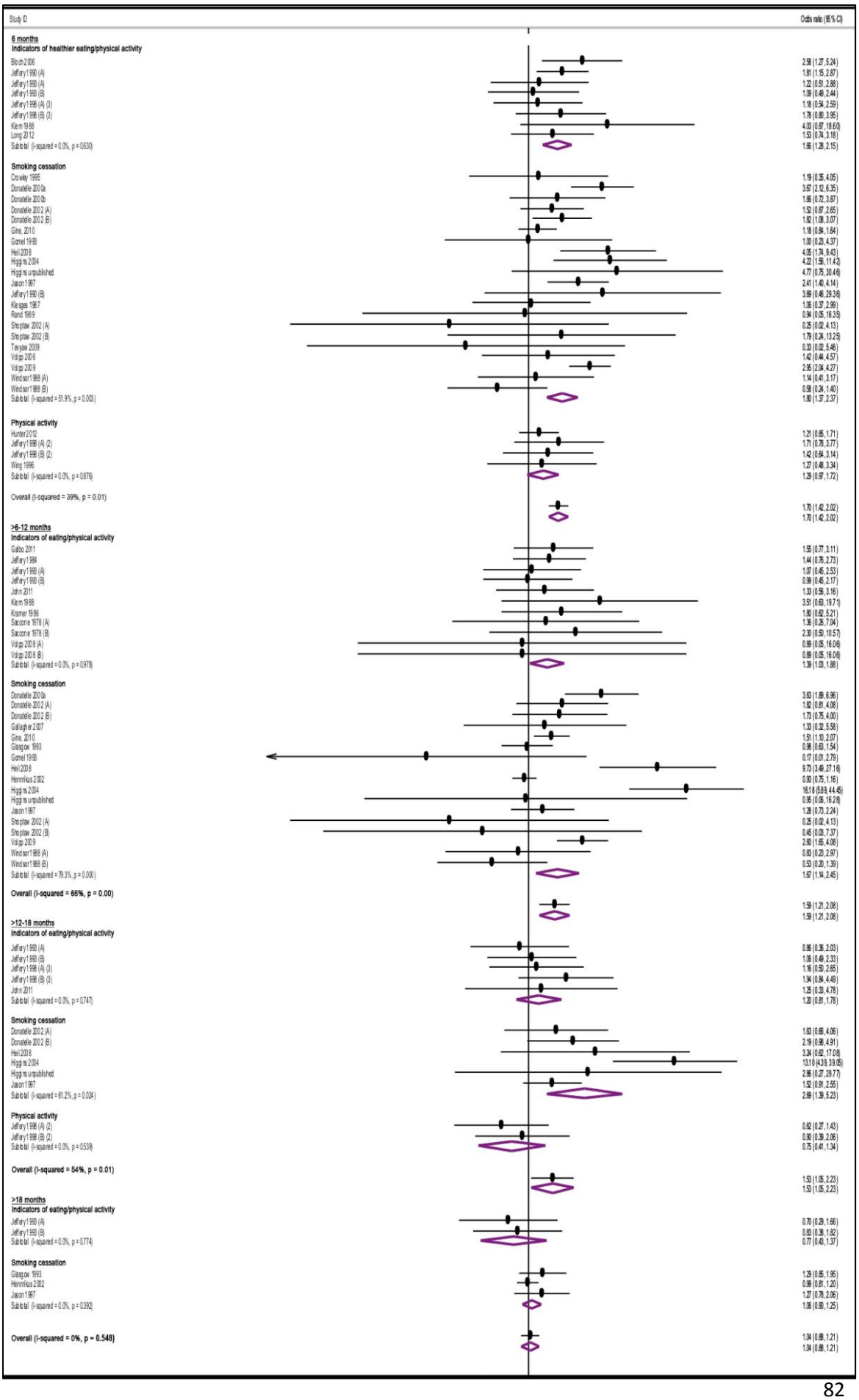
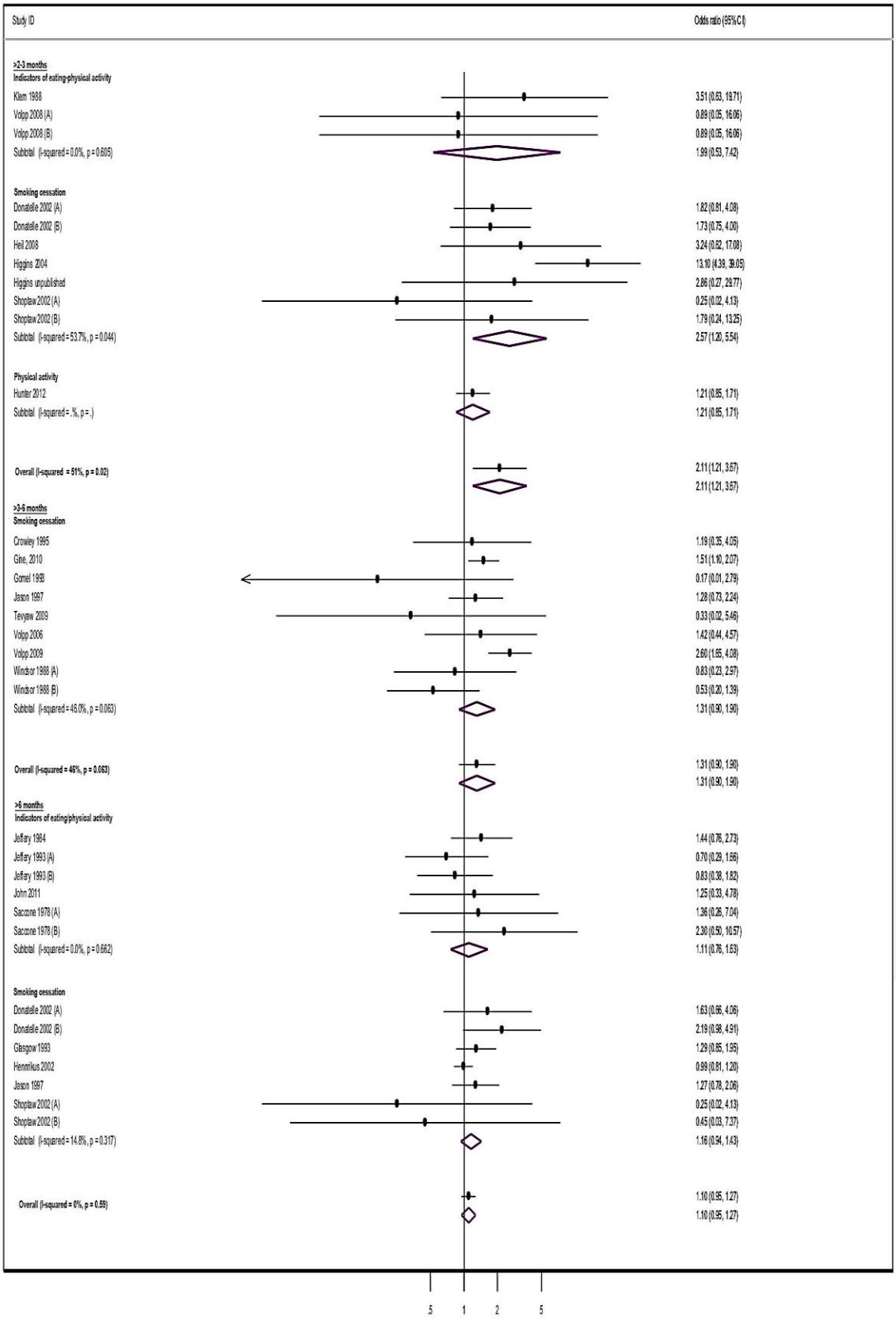


Figure 4.4: Study estimates of financial incentive effects on health behaviours at time-points after incentive removal



The change of effects over time

The effects of financial incentives on behaviour overall follow a monotonic trend, with effects weakening over time. A similar pattern is also observed with regards to effects on indicators of healthier eating and/or physical activity, with point estimates of summary odds ratios decreasing with measurement time. This trend, is less clear for smoking cessation, but becomes more apparent after exclusion of comparisons at >12–18 months from intervention start, where the summary odds ratios are estimated less precisely, as suggested by the wider 95% confidence intervals (Figure 4.5).

When focusing on effects after removal of the incentives, this monotonic trend is also observed, with effects on behaviour overall weakening over time. A similar pattern is also observed with regards to effects on smoking cessation and indicators of healthier eating and/or physical activity, with point estimates of summary odds ratios decreasing with measurement time (Figure 4.6)

Figure 4.5. The effect of financial incentives at multiple measurement times

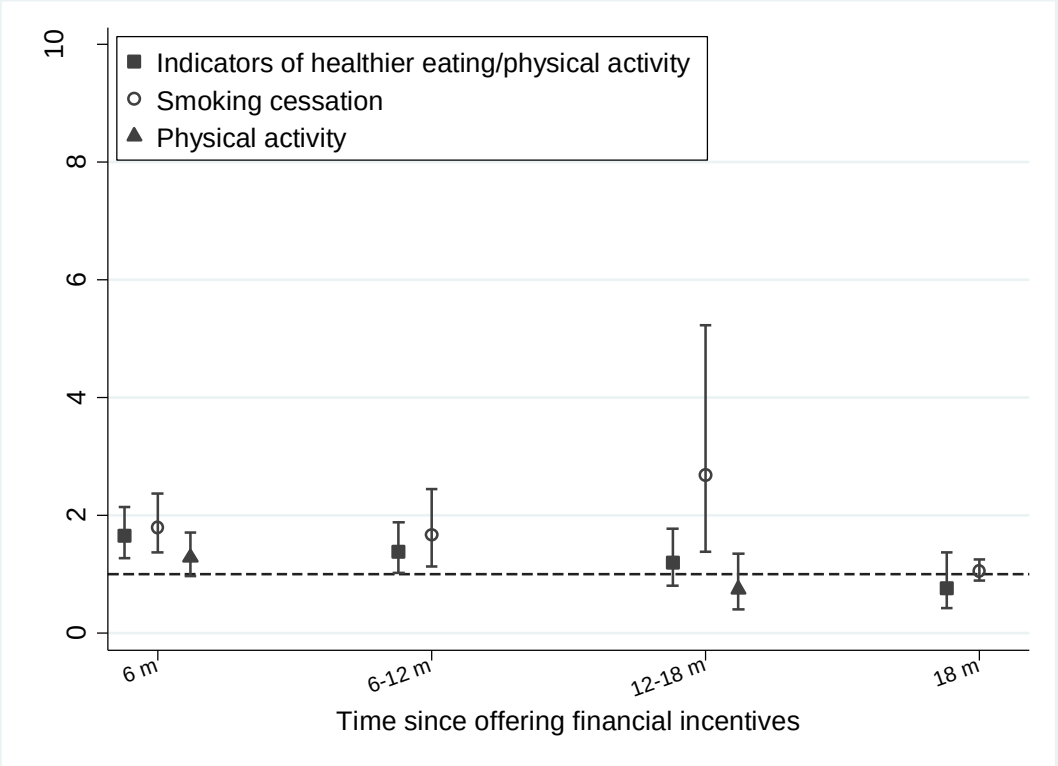
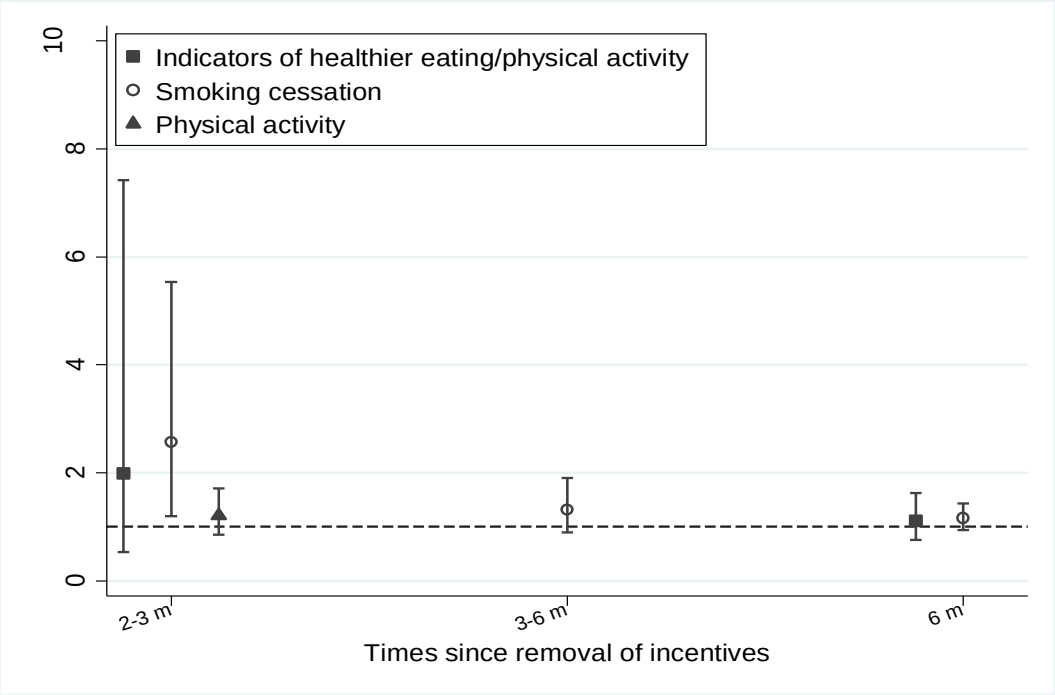


Figure 4.6. The effect of financial incentives at multiple measurement times after incentive removal



Effect modifiers (Table 4.3)

The effect of financial incentives was not modified by the target behaviour, the incentive value or the incentive type at any of the assessed time-points (Table 4.3). Both univariable and multivariable meta-regressions (*latter are found in Appendix 4.5*) produced similar results. Univariable analysis showed participants' deprivation level to modify the effect size at >6-12 months from intervention start, but not at other time-points (Table 4.3). Studies including highly deprived participants (n=10) generated an average effect approximately twice the size of studies including non-deprived participants (n=10) (OR 2.17, 95% CI 1.22-3.85) (Figure 4.7). Multivariable analysis did not reveal any statistically significant effect modifiers (*Appendix 4.5*) at >6-12 months from intervention start. Meta-regression analyses were not performed for outcomes measured >12-18 and >18 months from intervention start or >3-6 months after incentive removal due to the small number of between-study comparisons at these time-points (n=13; n=5 and n=9 respectively).

One interaction was found to be statistically significant at the 5% statistical significance level at 6 months from intervention start: low monetary value incentives were associated with a decrease in smoking cessation rates compared to higher monetary value incentives. The interaction modified the effect size of financial incentives on smoking

cessation but not the direction of the effect. The summary odds ratio for smoking cessation from studies using financial incentives of low monetary value (n=10) vs. high monetary value (n=11) was 1.49 (CI 95% 1.12-1.98). We did not identify any statistically significant two-way interactions at the 5% statistical significance level at time-points other than 6 months from intervention start.

Figure 4.7*:* The effect of financial incentives on health-behaviour according to recipients' deprivation level at multiple measurement times

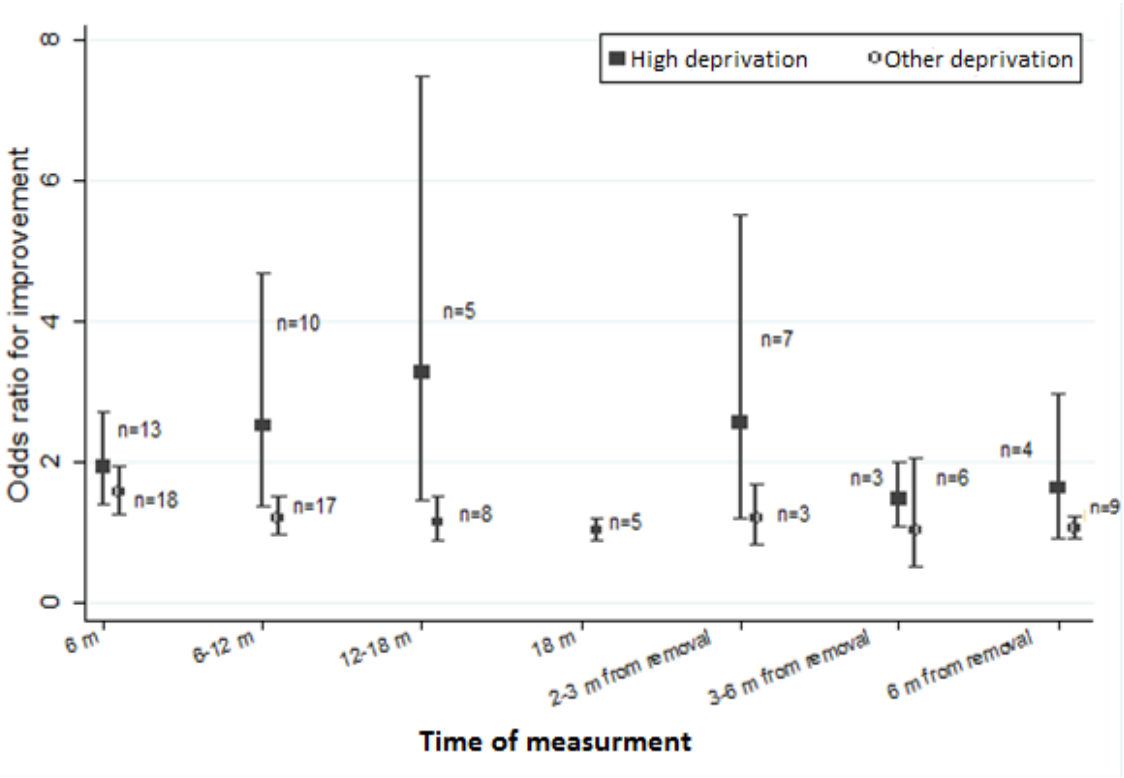


Table 4.4. Results from meta-regression analyses according to time-point

	Univariable meta-regression							
	Measurement time from intervention start				Measurement time after incentive removal			
	6months		>6-12 months		>2-3 months		>6 months	
Behaviour Type	Coefficient estimates (95% CI)	P-values	Coefficient estimates (95% CI)	P-values	Coefficient estimates (95% CI)	P-values	Coefficient estimates (95% CI)	P-values
Smoking cessation vs. Healthier eating/physical activity indicators	0.73 (0.44 -1.23) (n=21 vs 8)	0.23	0.85 (0.44-1.65) (n=17 vs 11)	0.63	0.70 (0.09 -6.18) (n=7 vs 3)	0.70	0.95 (0.57-1.60) (n=7 vs 6)	0.83
Smoking cessation vs. Physical activity	0.90 (0.59-1.37) (n=21 vs 4)	0.60	- (n=17 vs0)	-	0.47 (0.08-2.87) (n=7 vs 1)	0.36	- (n=7 vs 0)	-
Attainment certainty								
Certain vs. Uncertain	0.57 (0.11-3.05) (n=30 vs 2)	0.46	0.53 (0.16-1.69) (n=24 vs 2)	0.27	0.41 (0.01-16.65) (n=10 vs 1)	0.60	0.78 (0.54-1.14) (n=11 vs 1)	0.18
Certain vs. Certain and uncertain	0.71 (0.28-1.80) (n=30 vs 2)	0.51	0.44 (0.13-1.48) (n=24 vs 2)	0.18	- (n=10 vs 0)	-	1.02 (0.58-1.79) (n=11 vs 1)	0.94
Monetary value								
High vs. Low	0.84 (0.58-1.22) (n= 18 vs 15)	0.35	0.81 (0.41-1.58) (n=19 vs 9)	0.52	0.66 (0.18-2.48) (n=8 vs 3)	0.50	1.36 (0.89-2.07) (n=8 vs 6)	0.14
Level of deprivation								
Other vs. High	1.25 (0.84-1.87) (n=18 vs 13)	0.26	**2.17 (1.22-3.85) (n=17 vs 10)**	**0.01**	2.32 (0.50-10.71) (n=3 vs7)	0.24	1.55 (0.79-3.03) (n=9 vs 4)	0.18
Procedure standardisation bias								
Low vs. High	1.33 (0.85-2.08) (n=29 vs 4)	0.13	1.09 (0.57-2.07) (n=18 vs 10)	0.89	0.40 (0.03-5.71) (n=8 vs 2)	0.45	1.16 (0.68-1.98) (n=9 vs 4)	0.56
Outcome measure reliability bias								
Low vs. High	0.90 (0.58-1.39) (n=24 vs 7)	0.62	0.65 (0.24-1.76) (n=24 vs 2)	0.38	0.39 (0.07-2.09) (n=8 vs 1)	0.23	0.88 (0.60-1.29) (n=9 vs 2)	0.48
Low vs. Unclear	0.95 (0.50-1.82) (n=24 vs 2)	0.87	1.07 (0.35-3.31) (n=24 vs 2)	0.90	0.58 (0.13-2.58) (n=8 vs 2)	0.42	1.66 (0.78-3.54) (n=9 vs 2)	0.17

Note: n denotes number of comparisons

Discussion

Financial incentives changed repeated health-related behaviours with effects lasting up to 18 months from the beginning of intervention, but weakening over time. Changes were sustained up to three months after removal of the incentives but not thereafter. Neither target behaviour, incentive value nor incentive type independently modified effectiveness at any time-point. An interaction between the target behaviour and incentive value modified effects at six months from intervention start, with offers of lower monetary value decreasing the likelihood of smoking cessation. Recipients' deprivation level modified effects between six and 12 months from intervention start, with higher deprivation levels increasing behaviour-change, but not at other time-points.

Interpretation of findings

This is the first review, of which we are aware, to provide an overall estimate of the impact of financial incentives across repeated health-related behaviours. Interpretation of the related findings, however, requires some caution for the following reasons. First, not all behaviours classified as repeated health-related were represented in this review. Searches did not yield any studies assessing eating-related behaviours or alcohol consumption that were eligible for inclusion. Second, although the overall impact of financial incentives on repeated health-related behaviours weakened over time, this coincided with a decrease in the number of comparisons assessing outcomes at each time-point, implying a lack of statistical power to detect longer-term effectiveness. For example, 33 comparisons were available at six months from intervention start, whereas only five included assessments beyond 18 months. Third, although the effectiveness of financial incentives was not modified by the target behaviour at any of the assessment time-points, inspection of their impact on individual behaviours suggests that summary effect sizes were driven by studies assessing smoking cessation. This was the only behaviour for which changes were maintained up to 18 months from intervention start and sustained after removal of the incentives. Finally, although physical activity was not affected by the offer financial incentives, the findings do not allow conclusions to be drawn due to lack of statistical power. Only three related studies met criteria for inclusion in this review (Hunter, 2011; Jeffery et al., 1998; Wing et al., 1996), with only one including assessments after the removal of incentives (Hunter, 2011).

Most of the studies included in this review targeted smoking cessation. This could partially explain why the use of financial incentives appears to be more promising for improving this behaviour compared with others. Contrary to the conclusions of previous reviews (Cahill & Perera, 2011; Jochelson, 2007; Kane et al., 2004), we found that changes to smoking cessation were sustained after incentive removal. This is perhaps due this review's explicit focus on impacts after incentive removal, which hitherto had not been systematically assessed. Alternatively, it might be related to the inclusion of studies assessing the impact of financial incentives on smoking cessation during pregnancy (Donatelle & Hudson, 2002; Donatelle et al., 2000a; Donatelle et al., 2000b; Heil et al., 2008; Higgins et al., 2004; Higgins et al., 2012), most of which included post-incentive follow-up assessments. Indeed, five out of seven comparisons assessing smoking cessation >2-3 months after incentive removal targeted pregnant smokers. Financial incentives are the single most effective intervention for smoking cessation in pregnancy (Bauld & Coleman, 2009; Lumley, Chamberlain, Dowswell et al., 2009), but the sustainability of their impact has remained unexplored. One of the characteristics of the studies demonstrating this effectiveness is the use of large rewards. Large rewards have been predicted to motivate greater behaviour-change (Jochelson, 2007; Lussier et al., 2006; Sigmon & Patrick, 2012; Sutherland et al., 2008). Incentive value in the present review was found to moderate the impact of financial incentives on smoking cessation at six months from intervention start, but not after incentive removal or at any other time-points. If the sustained effects of incentives on smoking cessation reported herein are related to the inclusion of studies incentivising pregnant smokers, then perhaps the key variable is not only incentive value, but also some of the other specific incentive scheme characteristics of these studies, the role of which was not assessed in this review. For example, apart from using large rewards, these studies also employed high frequency incremental reinforcement schedules that became gradually less frequent over time (Marteau, Thorne, Aveyard, et al, 2013). Alternatively, the classification of incentive value into 'low' and 'high' in this review was perhaps too crude to allow for effects to be detected at other time-periods, or there was insufficient statistical power to do so. At six months from intervention start, studies assessing smoking cessation were almost evenly split by value level, with a relatively large number of comparisons falling under each category (high value: 11 comparisons; low value: 10 comparisons). At other time points, however, this split was uneven (i.e. >6-12 months high: 13, low: 4; >2-3 months from removal: high: 6, low: 1; >6 months from removal: high: 5; low: 2).

Although findings show that changes to smoking cessation can be sustained, there is no evidence to suggest that they do so beyond three months. Between three and six months from incentive removal only two studies significantly favoured the use of incentives (Giné et al., 2010; Volpp et al., 2009). The effectiveness of the latter has been attributed to its large sample size and use of large rewards (Cahill & Perera, 2011; Troxel & Volpp, 2012), characteristics shared by both these studies. There was insufficient power to conduct meta-regression analyses at this time point and determine, whether under some conditions, improvements could be sustained beyond three months. The lack of significant effects and effect modifiers six months from removal, however, suggest that ultimately changes disappear, regardless of the circumstances surrounding incentive delivery.

In interpreting the impact of financial incentives on indicators of healthier eating and/or physical activity, it should be noted that outcomes assessed beyond six months from the beginning of interventions refer to weight-loss. Consistent with the findings from a previous meta-analysis (Paul-Ebhohimhen & Avenell, 2008) financial incentives did not improve weight-loss beyond 12 months from the beginning of intervention and changes were not sustained after incentive removal. The temporal pattern of weight-loss in all related studies included in this review was similar. Rate of weight-loss was faster at the beginning of treatments, slowed down gradually over time and was followed by slow regain. This pattern is seen with most weight-loss interventions (Jeffery, 2012). The reduced duration of incentive effects on weight-loss compared to smoking cessation might have several causes. First, change in body weight is the cumulative sequence of many different behaviours over time rather than the consequence of a single behaviour (Jeffery, 2012). Second, many of the included studies had small sample sizes. This, in combination with the reported weakening of incentives effects over time might have resulted in a lack of power to detect effects at later time-points. Furthermore, reported outcomes varied greatly between studies, from mean change in weight from baseline, to the proportion of individuals achieving minimum weight-loss equivalent to 5% of initial body weight, to the proportion of participants achieving pre-specified weight loss goals and the proportion maintaining post-treatment weight. Outcomes not relying on achievement of a pre-specified goal (e.g. mean weight-loss) are potentially more sensitive than others (e.g. the proportion of individuals achieving minimum weight-loss, equivalent to 5% of initial body weight) in revealing significant differences between groups. Consequently, the variability in reported outcomes might have affected the

potential to detect effects. Finally, whereas the majority of studies on smoking cessation used rewards, most studies on weight-loss used deposit contracts. Requiring individuals to pledge their own funds rather than directly reinforcing them might differentially affect outcomes. The moderating effect of this incentive characteristic was not assessed in the present review.

Also in contrast to the findings relating to smoking cessation, the value of the incentive was not found to modify incentive impacts on indicators of healthier eating and/or physical activity, including weight-loss. This is at odds to the large body of research documenting a positive association between magnitude of reinforcement and behaviour change (e.g. Catania, 1963; Kane et al., 2004; Lussier et al., 2006). This null finding might be related to a lack of power. Although at certain time-points (i.e. >6-12 months and >6 months from removal) studies were evenly split by value category, the number of comparisons was perhaps too small to detect any effects.

Financial incentives have been predicted to be more effective in motivating behaviour-change in the most socially and materially deprived (Sutherland et al., 2008). Consistent with this prediction, between six and 12 months from the beginning of interventions, the effect of incentives across repeated health-related behaviours was greater for those classified as highly deprived. This is the first empirical evidence to date, we are aware of, demonstrating the role of recipients' deprivation level in the moderation of the impact of financial incentives on health-related behaviour. It is an important finding as it suggests that the use of incentives schemes can help reduce health inequalities. Although the impact of incentives appeared greater for highly deprived individuals compared to those classified as non-deprived at all assessed time-points, differences were significant only between six and 12 months from intervention start. This is most likely related to a lack of statistical power to detect effects at other assessed time-points. The number of comparisons falling under each deprivation category at time-points after removal of the incentives was relatively small and unevenly split (>2-3 months after removal: high: 7, other:3; >6 months high:4; other: 9). Comparisons at six months from intervention start were similar in size and split to those at >6-12 months. Detection of effects at the latter time-point coincided with a greater proportion of studies including non-deprived participants having removed financial incentives compared to studies including deprived participants. This might have resulted in reduced effect sizes in the

former, thus creating a big enough difference with the latter to be statistically significant.

The impact of financial incentives has also been suggested to differ according to whether the incentive attainment is certain (e.g. voucher or cash payment) or uncertain (e.g. a lottery ticket), with some studies demonstrating the superiority of cash payments over lotteries (Leung et al., 2002; Niza, Rudisill & Dolan, in submission). This review, did not find the certainty of incentive attainment to significantly affect outcomes, at any of the time-points. The most likely explanation for this null finding is that analyses were not powered to detect effects. Of the 34 studies included in the analyses, three were classified as 'uncertain' (Crowley et al., 1995; Hennrikus et al., 2002; Wing et al., 1996) two as both 'certain and uncertain' (Glasgow et al., 1993; Gomel et al., 1993), while one study (Volpp et al., 2008a) included two incentivised groups, one which was classified as 'certain' and the other as 'uncertain'. Consequently, no conclusions can be drawn from this review regarding the moderating role of the certainty of incentive attainment.

One of the issues in evaluating the use of financial incentives for changing health-related behaviours is that without appropriate control groups their effectiveness could be confounded by the processes inherit in their delivery. For example, attainment of incentives often requires additional involvement on behalf of both participants and personnel, such as frequent clinical appointment attendance, monitoring of the formers' performance etc., which could lead to an overestimation of the impact of financial incentives (Hagger et al., 2013; Johnston & Sniehotta, 2010). Similarly, outcome measures that could be achieved through deception could also result in the effectiveness of incentives being exaggerated (Lynagh, Sanson-Fisher & Bonevski, 2011). The present review attempted to assess the influence of potential confounders by including risk of bias judgements into the analyses relating to whether studies had standardised study procedures between incentivised and control groups and whether they had included reliable outcome measures. The findings provided some support in favour of the need to control these variables, especially when targeting smoking cessation. Between two and three months after incentive removal, significant positive effects were rendered non-significant when analyses included only studies that used standardised study procedures and reliable outcomes measures. After six months from incentive removal non-significant effects became significant when focusing only on studies that had standardised study procedures but included outcome measures of questionable

reliability. As findings are based on a small number of studies and are associated with a high probability of having resulted by chance (they were significant at the 10% statistical significance level) they should be interpreted with caution.

One of the concerns regarding the use of incentives for changing repeated health-related behaviours is their potential to adversely affect motivation to engage in the incentivised behaviour, thus making it less likely than before incentivisation that the behaviour is performed once the incentive is stopped (e.g. Deci et al., 1999; Frey & Jegen, 2001; Jochelson, 2007; Kane et al., 2004). For this claim to be supported one would expect individuals in the non-incentivised arms of studies to be more likely than those incentivised to perform the target behaviours after removal of the incentives. Consistent with the conclusions from a recent narrative review (Promberger & Marteau, 2013), findings presented herein provide no empirical evidence to support this. On the contrary, those incentivised were significantly more likely to sustain improvements up to three months after removal of the incentives, with a similar non-significant trend observed at other time-points.

Strengths

The main strength of the present review lies in the novelty of its analyses. It is the first thus far to provide an overall estimate of the impact of financial incentives across a range of repeated health-related behaviours. It also the first review to focus explicitly on assessment of the sustained impact of financial incentives on repeated health-related behaviours i.e. after the removal of incentives. Furthermore, it is one of the few reviews to systematically assess the role of potential effect modifiers and study characteristics, thus attempting to answer not only the question of whether financial incentives are effective in changing repeated health-related behaviours, but under which circumstances they are most effective. In assessing the impact of potential effect modifiers, it is the first study we are aware of to empirically demonstrate the role of deprivation level in the moderation of the impact of financial incentives on health-related behaviours, thus highlighting the potential of incentives schemes to reduce health inequalities.

Limitations

The main limitation with this review is the small number of studies and associated lack of statistical power for certain comparisons, which restricts the conclusions that can be drawn with regards to: i. the sustained impact of financial incentives on overall

behaviour beyond 18 months from intervention start; ii. the impact of financial incentives on physical activity; and iii. the role of certain of the targeted effect modifiers, including that of deprivation level at all assessed time-points. Furthermore, although results revealed the modifying role of incentive value and recipients' level of deprivation, the role of many other potentially important effect modifiers was not examined. A few of these include whether the incentive scheme involved the use of a deposit contract system, the duration of the incentive scheme, the immediacy of incentive delivery and the frequency of reinforcement. An improved understanding of the role of these potential effect modifiers is needed to inform the design of optimal personal financial incentive schemes.

Implications

Behaviour-change maintenance is critical for chronic disease prevention and should be the aim of every intervention aimed at changing repeated health-related behaviours. Although the use of financial incentives appears useful in initiating healthier behaviours, with changes sustained for some months after incentive removal, results from this review reveal that ultimately their effects disappear. This is a problem shared by most interventions targeting repeated behaviours at an individual level (Ogden, 2012). This review compared the use of financial incentives to conditions where incentives were absent, but not to other interventions. It is therefore, not known whether incentives are better at producing short-term changes compared to other behaviour-change strategies. If so, it might be worth complementing their use with behaviour-maintenance and relapse prevention strategies, which could be delivered after incentive removal. The suggestion to combine the use financial incentives for changing repeated health behaviours with other supportive strategies has also been advocated by others (Hagger et al., 2013; Lynagh et al., 2011). If, however, incentives are no more effective than other related interventions, then one might question their cost-effectiveness. Even if cost-effective, their application depends on their acceptability to policy makers, health professionals and the public. The use of financial incentives for health promotion attracts negative views (Promberger, Brown, Ashcroft et al., 2011), although these can be attenuated by evidence of their effectiveness (Promberger, Dolan & Marteau, 2012). Consequently, what is found effective in research will not necessarily be considered acceptable in practice. For example, following completion of one the few studies included in this review which showed sustained smoking cessation beyond three months after incentive removal (Volpp et al., 2009), the company where the study was run

decided to implement an incentive scheme based on the study findings. However, feedback from non-smoking employees led to the replacement of the $750 reward, used in the trial, with a $625 penalty for smokers (Volpp, Asch, Galvin et al., 2011). Given the lack of sustainable effects, in addition to the potential cost-effectiveness and acceptability issues surrounding the use of financial incentives for changing health-related behaviours, future research and policies should investigate and consider the application of financial mechanisms in environment policies that would alter the consequences of repeated health-related behaviours at a population level (e.g. through taxation or product pricing), rather than directly reward individuals.

Conclusion

Financial incentives change repeated health-behaviours and may help reduce health inequalities. However, their role in reducing the burden of non-communicable diseases is potentially limited, given the lack of evidence regarding the sustainability of effects beyond three months after incentive removal.

The next chapter

The findings presented in this chapter demonstrate that financial incentives can improve repeated health-related behaviours with effects sustaining up to three months from incentive removal. They also highlight the need to control for the variables and processes inherit in the delivery of financial incentives. The next chapter presents the findings from Study 2, a qualitative study complementing the findings from Study 1, by further exploring the variables that could potentially confound the impact of financial incentives on health-related behaviours.

Chapter 5

Financial incentives for smoking cessation during pregnancy: it is from being paid or from the extra aid?

Abstract

Background: Financial incentives appear to be effective in promoting smoking cessation in pregnancy. The mechanisms by which they might operate, however, are poorly understood. The present study examines how financial incentives for smoking cessation during pregnancy may work, by exploring pregnant women's experiences of trying to stop smoking, within and outside of a financial incentives scheme.

Methods: Thirty-six (n=36) UK-based pregnant smokers (n=36), offered standard NHS Stop-Smoking Services, of whom twenty (n=20) were enrolled in a financial incentives scheme for smoking cessation (n=20) and sixteen (n=16) were not, were interviewed about (i) their motivation to stop smoking, and (ii) the factors they perceived as influencing their quitting efforts. Framework Analysis was used to analyse the data.

Results: Women in the two groups reported similar reasons for wanting to stop smoking during pregnancy. However, they described dissimilar experiences of the Stop-Smoking Services, which they perceived to have differentially influenced their quit attempts. Women who were incentivised reported using the services more than women who were not incentivised. In addition, they described the motivating experience of being monitored and receiving feedback on their progress. Non-incentivised women reported problems receiving the appropriate Nicotine Replacement Therapy, which they described as having a detrimental effect on their quitting efforts.

Conclusion: Women participating in a financial incentives scheme to stop smoking reported greater engagement with the Stop-Smoking Services, from which they described receiving more help in quitting than women who were not part of the scheme. These results highlight the complexity of financial incentives schemes and the intricacies surrounding the ways in which they operate to affect smoking cessation. These might involve influencing individuals' motivation and self-regulation, changing engagement with and provision of support services, or a combination of these.

E Mantzari, E., F Vogt, F., Marteau, T.M. (2012). Financial incentives for smoking cessation during pregnancy: is it from being paid or from the extra aid? *BMC Pregnancy and Childbirth,* 12:24 doi:10.1186/1471-2393-12-24 (*Appendix 5.1*).

Background

Smoking during pregnancy is a major cause of infant morbidity and mortality (Floyd, Rimer, Giovino et al., 1993) and contributes greatly to health inequalities (Power & Matthews, 1997). It causes up to 4,000 deaths per year in the UK from miscarriages and stillbirths, and leads to increases in preterm births, low birth-weight babies (Charlton, 1996; Royal College of Physicians, 1992), sudden infant death, asthma and attention deficit hyperactivity disorder (Batstra, Hadders-Algra & Neeleman, 2003; Charlton, 1996). Despite these adverse consequences, many women fail to quit while pregnant, with at least 17% of mothers in the UK smoking throughout their pregnancies in 2005 (The Information Centre, 2007). Reducing the incidence of smoking during pregnancy has therefore become an important focus of health policies in the UK and elsewhere.

Existing interventions have been relatively successful in promoting smoking cessation during pregnancy (Dolan-Mullen, Ramirez & Groff, 1994; Lumley, Oliver & Waters, 2004). A recently updated systematic review (Lumley et al., 2009) found the most effective of these to involve the use of financial incentives for stopping smoking (financial incentives vs. other interventions: OR 0.73, 95% CI 0.66 to 0.82). Findings were based on results from four trials conducted in the USA (Donatelle et al., 2000a; Heil et al., 2008; Higgins et al., 2004; Sexton & Hebel, 1984) and were confirmed by a further meta-analysis of three of these (Bauld & Coleman, 2009). The mechanisms by which financial incentives operate to influence behaviour, including smoking cessation during pregnancy, are, however, poorly understood.

The effectiveness of financial incentives in achieving behaviour change, including smoking cessation during pregnancy, might result from direct influences to individuals' motivation and self-regulation. These influences potentially enable people to overcome the costs and barriers associated with initiating the target behaviour and move them past the "threshold" needed to act. Specifically, incentives might operate according to learning theory principles, by linking the target behaviour, in this case smoking cessation, to a positively evaluated stimulus, such as money, thus strengthening the value associated with the target behaviour (Marteau, 2010). Additionally they might work by influencing individuals' outcome expectations, i.e. their valuation of the likely consequences of a behaviour (Bandura, 1986), or by facilitating allocation of limited

cognitive capacity in such a way as to achieve the now more highly valued altered behaviour (Marteau, 2010).

The effectiveness of financial incentive schemes in changing behaviour might also result from indirect influences, mediated by changes to some aspects of the process involved in their delivery. For example, the provision of incentives requires contact between health professionals, who measure achievement of the target behaviour, and patients (Johnston & Sniehotta, 2010). Incentives might therefore operate by increasing health professionals' engagement with patients or through the additional involvement required on behalf of the latter, such as attending clinics or undergoing particular tests, as part of assessing eligibility for a reward. In addition, they might influence behaviour through the contract-agreement, which specifies the conditions of exchange between behaviour and money, encompassed in their use (Johnston & Sniehotta, 2010), given that behavioural contracts have been shown to improve patients' adherence to health care activities, even in the absence of the exchange of money (Bosch-Capblanch et al., 2007). It is also possible, however, that the effectiveness of financial incentives in achieving behaviour change might also result from an interaction between direct influences to individuals' motivation and self-regulation and indirect influences mediated by changes so certain aspects involved in the process of incentive delivery.

Understanding the mechanisms by which financial incentives influence behaviour is key to determining how to maximise their effectiveness (Bonner, 1999) and for designing optimal incentive schemes. Research is therefore needed to illuminate the processes involved in producing their beneficial effect for smoking cessation during pregnancy. Given the lack of knowledge regarding the factors that are operating when financial incentives schemes are used, qualitative research has an important contribution to make. The present qualitative study attempts to explore these factors by examining and comparing the stop-smoking experiences of pregnant women who were incentivised for smoking cessation and of pregnant smokers who were not incentivised for cessation.

Methods

Design

This is a comparative qualitative study, based on semi-structured interviews aiming to identify differences between the experiences of pregnant smokers who were incentivised for cessation and of those who were not.

Participants

Participants were thirty-six (n=36) pregnant smokers, twenty (n=20) of whom were receiving financial incentives for smoking cessation (incentivised group). The remaining sixteen (n=16) were only offered NHS Stop-Smoking treatment[2] (control group). Participants were recruited through an opportunistic sampling frame involving a population of 115 pregnant smokers living in the greater Birmingham area, who were referred by their midwives to the NHS Stop-Smoking Services during the period September 2009 to May 2010 and:

i. were enrolled in a pilot scheme of incentivising smoking cessation run by the Birmingham East & North Primary Care Trust (BEN PCT), (in partnership with the Young Foundation as part of the Healthy Incentives (HI) Partnership (www.healthyincentives.org.uk)), or
ii. were eligible to be part of a comparison cohort, because they lived in areas selected as "comparison" areas.

Women enrolled in the financial incentives scheme were offered vouchers for quitting smoking. The offer of vouchers was dependent upon women's area of residence, i.e. whether they lived within the two pilot areas or not. Pilot areas were selected from the districts of Birmingham with the highest prevalence of smoking during pregnancy. The pilot financial incentive scheme aimed to enrol 200 pregnant smokers by the end of

[2]The NHS Stop Smoking Services were set up in England in 1999 to provide assistance to smokers motivated to quit. Services are provided in group or individual sessions, depending on local circumstances and patient preferences. Services vary in the types of interventions they provide and in their approaches to delivery Guidelines, however, specify that Nicotine replacement therapy (NRT), Champix (varenicline) and Zyban (bupropion), in combination with intensive behavioural support should be offered to all smokers using the services (Department of Health, 2008). Other elements services should include are: monitoring of carbon monoxide (CO) levels and feedback of results (Chambers, 2009). The guidelines also specify that pregnant smokers should be offered the full range of services, including biochemical verification of smoking status and nicotine replacement therapy (Chambers, 2009).

2010 and to compare their smoking cessation rates against those of a comparison cohort of 200 women, recruited for evaluation purposes from parts of the PCT where financial incentives were not offered. Comparison areas were chosen by matching the pilot areas with two geographically similar districts with equivalent rates of smoking during pregnancy and comparable socio-economic composition. At the time the current study was conducted, 91 women were enrolled in the pilot financial incentives scheme, of whom 81 consented to be contacted for an interview. We aimed to recruit 20 of these women for the interview and achieved this with telephone calls to the first 58. Furthermore, 24 pregnant smokers had been recruited into the comparison cohort, of whom 20 consented to be contacted for an interview. All these women were contacted and 16 agreed to be interviewed (Figure 5.1).

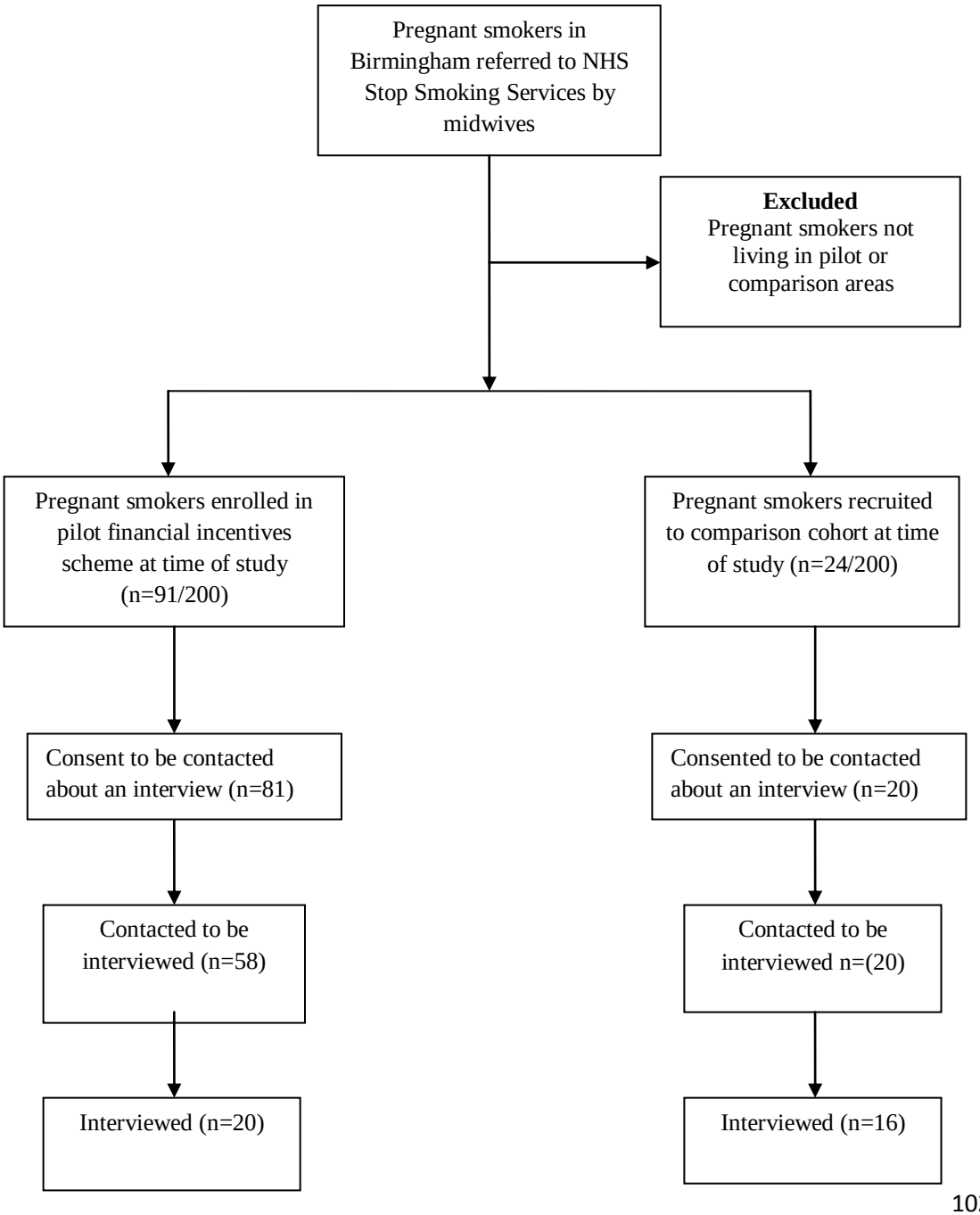
Following the recommendations by Guest, Bunce & Johnson (2006) as well as those by Kuzel (1992) and Morse (1994), this sample size was considered sufficient for achieving data saturation. Indeed, saturation of data for the themes of interest was achieved in both groups by the 15th interview, suggesting that the group sizes were sufficiently large to capture the range of women's smoking cessation experiences.

The mean age of participants in the incentivised group was 28 (range: 19–43). The mean age of participants in the control group was also 28 (range 17–39). The majority of participants were of White-British origin, with one woman in the control group being of Indian decent and another in the incentivised group originating from Hong-Kong. Although, minority ethnic groups constitute approximately one third of Birmingham city's population (with the Pakistani being the largest minority group followed by the Indian (Birmingham City Council, 2009)), women from minority ethnic groups are less likely to smoke compared to the general population (National Statistics, 2006). Compared to white women, they are also less likely to smoke during pregnancy (Hawkins, Lamb, Cole et al., 2008) and are less likely to set quit dates with the stop smoking services (The NHS Information Centre for Health and Social Care, 2011a). The majority of women in both groups were of a lower socio-economic class, as indicated by their Index of Multiple Deprivation Scores (incentivised group: 42.35; control group: 42.51) which are above the average for Birmingham[3]. Most women in

[3] According to the West Midland Regional Observatory the most deprived area within the West Midlands is Birmingham with 39.63% of its Lower Layer Super Output Areas (LSOAs) ranking in the worst 10% in England and an average IMD score of 38.41.

both groups were unemployed. Of those who were employed, most held skilled non-manual and semi-skilled manual jobs in fields such as social care, maintenance and cleaning, automobile mechanics and law enforcement. At the time of the interview, six (n=6) women in the incentivised group and five (n=5) in the control group had already delivered their babies. Furthermore, one individual in the incentivised group had miscarried. With regards to their smoking status, eight (n=8) women in the incentivised group and four (n=4) in the control group were smoke-free at the time of the interview. The remaining 24 individuals were still smoking.

Figure 5.1. Recruitment of participants



Procedure

Women in both groups were enrolled into the Stop-Smoking Services by the "Call to quit" call-centre (Birmingham's telephone line for information on local smoking cessation services). Women taking part in the financial incentives scheme for smoking cessation were asked by the call-centre's representative about their willingness to be contacted about the possibility of being interviewed about their experiences of quitting smoking. Women not taking part in the scheme were informed by a research midwife working for BEN PCT of the possibility of being interviewed. Women in both groups willing to be contacted about the study were approached by the interviewer (EM) via telephone. She informed them about the purpose of the research and enquired about their willingness to participate. At this point, all women were advised that they would receive £20 in cash to compensate for their time spent completing the study (*See Appendix 5.2 for Participant Information Sheet*). A time and place [for a face-to-face interview] was arranged with those agreeing to be interviewed. The majority of participants chose to be interviewed in their homes, with one woman from the control group opting to be interviewed at her place of work (*See Appendix 5.3 for Consent form*). Ethical Approval for this study was granted by the NHS Birmingham, East, North and Solihull Research Ethics Committee, ref no 09/H1206/105*)*

Interviews

Interviews were semi-structured and followed an interview schedule (*See Appendix 5.4*) to elicit information on women's experiences of smoking cessation. The schedule was piloted with five pregnant smokers attending prenatal appointments at a London hospital.

Interviews lasted an average of 23 minutes and were digitally recorded. Upon their completion, women were thanked and received £20 in cash to compensate for the time spent participating in the interview.

Data analysis

Anonymised interviews were transcribed verbatim and analysed using Framework Analysis (Ritchie & Spencer, 2002) with the purpose of identifying and comparing the themes emerging in the accounts given by the two groups of women, with regards to i) their motivation for wanting to quit smoking, and ii) the factors they perceived as

facilitating and inhibiting their quit attempts (*See Appendix 5.5 for resulting Framework*)

Framework Analysis was chosen because it provides a method of addressing specific research questions rather than for purely exploratory purposes. It consists of a matrix-based analytic method, which facilitates rigorous and transparent data management, such that all stages of analysis can be systematically conducted.

The analysis was conducted separately for each group of women. The resulting themes of interest where then tabled and compared to identify similarities and differences.

Results

The themes emerging in the accounts given by the two groups of women, with regards to i) their motivation for wanting to quit smoking, and ii) the factors they perceived as facilitating and inhibiting their quit attempts, are presented below.

Reasons for wanting to quit smoking during pregnancy

Women who were incentivised for smoking cessation and those who were not reported similar reasons for wanting to stop smoking during pregnancy, which were grouped under five themes: (i) Concern for baby, (ii) Feeling pressured, (iii) Financial issues, (iv) Concern for self and (v) Concern for existing children (Table 5.1).

Table 5.1. Reasons for wanting to quit smoking during pregnancy

Factor	Description	Incentivised Group	Non-Incentivised Group
Concern for Baby	Being pregnant and concerned about the possible consequences of smoking on the baby	✔	✔
Feeling pressured	**Internal Pressure.** Experiencing guilt for smoking while pregnant and feeling pressure from self not to do so	✔	✔
	External Pressure. Experiencing pressure from others not to smoke	✔	✔
Financial issues	**Expense of smoking.** Not affording to smoke and wanting to save money	✔	✔
	Financial Incentives. Wanting to get the vouchers	✔	***N/A***
Concern for self	Concern about the illnesses and physical damage (including damage to appearance) caused by smoking, about consequences on existing health problems (e.g. asthma) and wanting to increase energy levels	✔	✔
Concern for existing children	Being concerned about the consequences of smoking on the health of existing children, wanting to reduce the possibility of them becoming smokers because of exposure to smoking, and wanting to avoid causing children distress due to personal smoking-related health problems	✔	✔

The provision of *Financial incentives* emerged as a sub-theme of *Financial issues* in incentivised women's accounts of their motives for trying to quit:

"And then the vouchers give me incentive to, like, stop smoking" (Participant14, incentivised group)

This, however, was not discussed as a primary reason and was often described as an "added bonus" for already wanting to quit:

"...the vouchers and the incentives and I thought well, that's even better. That, to me, was an added bonus that wasn't a reason quit, that was just like a reward for actually going to them." (Participant26, incentivised group)

Factors perceived as influencing the quit attempt

Perceived facilitators

The factors that were perceived as facilitating cessation efforts by women in both groups were grouped under two themes: (i) Endogenous factors and (ii) Exogenous factors. Facilitators described as deriving from within the self were classified as Endogenous, while those described as deriving from the environment were classified as Exogenous. Similar Endogenous factors were described by women who had been incentivised for cessation and those who had not. These were grouped under three sub-themes: (i) Awareness of the consequences of smoking and quitting; (ii) Dispositional factors (positive mood, motivational strength and personality characteristics); and (iii) Low addiction (Table 5.2).

Women in both groups also described comparable Exogenous factors as facilitating their efforts, which were grouped under five sub-themes: (i) Availability of support; (ii) Lack of exposure to smoke; (ii) Lack of opportunity to smoke; (iv) Stop Smoking Services; and (v) Financial incentives (Table 5.2). Their accounts differed, however, with regards to the dimensions that emerged in relation to one of the Exogenous factors, namely the Stop-Smoking Services. Although participants in both groups described the perceived beneficial effects of *Receiving support and advice* from the services and of the *Nicotine Replacement Therapy* that was provided by the services, incentivised

women discussed the former more consistently and at a greater length than did non-incentivised women.

Table 5.2.Factors perceived to facilitate smoking cessation attempt

Factor	Description	Incentivised	Non-Incentivised
Endogenous			
Awareness of the consequences of smoking & quitting	**On the baby's health.** Having knowledge or experience of the consequences of smoking on the unborn baby and thinking of potential harms	✔	✔
	On resources. Thinking that smoking leads to a waste of money and quitting efforts and experiencing the benefits of quitting on money and time	✔	✔
	On personal health. Thinking of the consequences of smoking on health and experiencing the physical benefits of quitting	✔	✔
Dispositional factors	**Personality.** Possessing traits associated with an increased ability to maintain focus and persist with efforts	✔	✔
	Motivational strength. Wanting to quit and being focused on quitting	✔	✔
	Mood. Being in a positive mood	✔	✔
Low addiction	**Lack of Cravings.** Not experiencing cravings for cigarettes and smoking	✔	✔
Exogenous			
Availability of support	Having friends, family and colleagues provide encouragement, praise, concurrent quitting, and prohibition of smoking or exposure to smoke	✔	✔
Lack of exposure to smoke	Lack of smoking in immediate environment and deliberately avoiding smoking situations	✔	✔
Lack opportunity to smoke	Decreased opportunities to smoke due to prohibition of smoking in certain places and around certain people, embarrassment of smoking in public, existence of health issues or preoccupation with other matters	✔	✔
Stop Smoking Services	**Receiving support& advice.** Being provided with support by speaking to smoking cessation counsellors and receiving information and advice	✔	✔
	NRT. Receiving NRT	✔	✔
	Receiving feedback. Getting feedback on progress either verbally from members of the services or by viewing improved CO levels	✔	✘
	Being monitored. Having CO levels checked by the Stop-Smoking Services	✔	✘
Financial incentives	Getting the vouchers	✔	***N/A***

Incentivised women additionally described the motivating experience of *Being monitored*:

"I think having that knowing that he was going to check what, what we were… the intake and stuff that was kind of the, the bit that was making me not want to smoke as well because it was like for the test…" (Participant02, incentivised group)

Specifically, women in this group described how having their carbon monoxide levels checked made them not want to smoke, out of the need to prove their abstinence:

"if I go to the chemist I have to prove to the pharmacist that I have cut down… it's a bigger goal" (Participant36, incentivised group)

This need appeared related to their fear of being judged for smoking during pregnancy:

"I knew that I'd got to go and check in, it's what, it's what that person would think of me I'm pregnant and I'm smoking and they'll going to know that I'm smoking. So it was that, having that support because I knew I'd have to face somebody. And I guess it was that being judged by…" (Participant26, incentivised group)

It also appeared to have arisen from their fear of being told off for not trying to quit:

"So I was constantly thinking about keeping my carbon monoxide levels down so I don't get into trouble… I thought it was like I keep smoking like my five/six a day then my carbon monoxide levels will either stay the same or go up a little bit. And it would be like, "You're not trying to quit why should I bother with you because you're not even participating". Do you know what I mean?" (Participant20, incentivised group)

Furthermore, it appeared to be associated with women's desire to avoid disappointing the smoking cessation counsellors:

"…they was very good. And I think it was going to somewhere like that every week that you didn't want to go and say, "I smoked." ((laughs)) You know it helped you… You didn't want to feel like I'd let it down or yeah (Participant25, incentivised group)

Being monitored was closely related to the sub-theme *Receiving Feedback*, which was also perceived by incentivised women as having a beneficial effect on their smoking cessation efforts:

"For me to be tested and everything is good because and it kind of makes you feel good when it comes up like that and they're like "Oh well done."" (Participant30, incentivised group)

In fact, *Receiving Feedback* was described as a consequence of *Being Monitored*: witnessing improved carbon monoxide levels and/or receiving related praise from the smoking cessation counsellors was perceived to increase confidence and was thus perceived as facilitating efforts:

"It's just more of a moral support I think really and checking your carbon levels and once you realise you've done good, you know, it boosts your confidence to keep, keep not smoking, do you know what I mean?" (Participant32, incentivised group)

These differences in experiences may be related to the observation that women in the control group were less engaged with the services, regardless of the fact that access was equal across the two groups: Whereas all women in the incentivised group had used the Stop-Smoking Services at least once, some individuals in the control group had failed to attend even their first appointments:

"So have you used the services this time round?"(Interviewer)
"Not as yet - no" (Participant21, control group).

Had non-incentivised women used the services, their experiences might have been more similar to those of incentivised women, given that service delivery was meant to be identical across the two groups, with the exception of voucher provision. Indeed, when asked how being monitored each week would potentially influence her attempt to stop smoking, one woman in the control group who had not attended the services reported:

"No I think that sounds good… Because it's, it's actually assessing you isn't it? You're not going to want to turn up there say you've not stopped smoking…. I think that would help me. …Because it's putting a little bit of pressure on me, it's pushing me a little bit…

Because you want to do it anyhow and I suppose like somebody watching you constantly that's what it's like isn't it? (*Participant35, control group*)

This differential engagement with the services seems related to the offer of *Financial Incentives* which appears to have motivated incentivised women to attend the services:

"I wouldn't have bothered going all the way to the doctors because at the beginning of your pregnancy and that you don't want to go out the house anyway because you're feeling sick and you're heavy and frumpy, and it just seems like a long way to go for nothing just to blow into a thing. With the vouchers it's like you're getting paid… rewarded to go there" (Participant14; incentivised group).

Indeed, the *Financial Incentives* were perceived as facilitating cessation attempts:

"the vouchers give me incentive to like stop smoking… So the vouchers have helped yeah because I'm thinking it's not that worth risking." (Participant14, incentivised group)

The vouchers appeared to have achieved this by providing a goal to work towards and a focus for resisting urges to smoke:

"I feel like I need another one [cigarette] I sort of sit there and think to myself well if I have this one it's going to mess me up getting my vouchers for my kids….I won't because I'll just think well I've got the vouchers to look forward to" (Participant16, incentivised group)

An alternative explanation for the absence of the aforementioned sub-themes from the accounts of non-incentivised women is that whereas monitoring in the incentivised group was conducted routinely due to attainment of the vouchers being contingent upon the results of such monitoring, monitoring in the control group was inconsistent. This accords with the accounts of two women in the control group, one of whom was not monitored and another who exceptionally, was:

"They don't really monitor you… They only do it, they only did it the once" (*Participant28, control group*).

"I think that was the most useful thing and knowing that you were going back the following week and that it had to be good because there was a quantifiable way of seeing if you'd been sticking to the routine." (Participant13, control group; 28:20–23).

Perceived inhibitors

Similarly to the perceived facilitators, the factors that were perceived to inhibit cessation efforts, both by women who were incentivised and those who were not, were grouped under two themes: (i) Endogenous and (ii) Exogenous factors. Obstacles described as deriving from within the self were classified as Endogenous, while those described as deriving from the environment were classified as Exogenous. Similar Endogenous obstacles were described by women who had been incentivised for cessation and those who had not. These were grouped under four sub-themes: (i) Disregarding the consequences of smoking and quitting; (ii) Dispositional factors, (negative mood, lack of motivation strength and personality characteristics); (iii) Perceived benefits of smoking; and (iv) Addiction (Table 5.3).

Furthermore, women in both groups reported similar Exogenous factors as compromising their efforts, which were grouped under five sub-themes: (i) Lack of support; (ii) Exposure to smoke; (ii) Availability of cigarettes and opportunity to smoke; (iv) Stop Smoking Services; and (v) Financial incentives (Table 5.3). Their accounts, however, differed with regards to the sub-themes that emerged in relation to one of the Exogenous obstacles, namely the Stop Smoking Services.

Table 5.3. Factors perceived to inhibit smoking cessation attempt

Factor	Description	Incentivised	Non-Incentivised
Endogenous			
Disregarding the consequences of smoking & quitting	**On the baby's health.** Discounting the harm of smoking because of having experienced disconfirming situations. Also discounting harm because of reduced cigarette consumption or because of inability to visualise baby and disregarding the benefits of quitting at advanced pregnancy stage	✔	✔
	On personal health. Blocking out personal health concerns and disregarding harms of smoking due to lack of relevant experience or by dissociating self from smokers with health problems	✔	✔
Dispositional factors	**Personality.** Possessing traits associated with a decreased ability to maintain focus and an increased likelihood of giving in to temptations	✔	✔
	Lack of motivation. Not really wanting to quit because of enjoying smoking or not considering quitting important	✔	✔
	Mood. Being in a negative mood	✔	✔
Perceived benefits of smoking	**To deal with stress.** Thinking that smoking helps with stress and using it to calm nerves down	✔	✔
	To deal with boredom. Smoking when bored	✔	✔
	To control weight. Thinking that smoking helps control weight and that quitting would result in weight-gain	✔	✔
	For social inclusion. Feeling left out when not smoking and using smoking for social inclusion	✔	✔
Addiction	**Habit & Associations.** Associating smoking with certain times of the day and being used to smoking in certain contexts	✔	✔
	Cravings. Experiencing cravings for cigarettes and smoking	✔	✔
Exogenous			
Lack of social support	Not receiving encouragement or praise, being told not to smoke and not having non-smoker peers to set example	✔	✔
Exposure to smoke	Being exposed to smoke in the immediate environment	✔	✔
Availability of cigarettes & opportunity to	Smoking in situations that allow doing so, such in the absence of certain people or when cigarettes are accessible	✔	✔
Stop Smoking Services	**Lack of Support& Advice.** Being judged, not being listen to, not being given sufficient explanations and advise, not being followed-up and lacking attention and individualized support	✔	✔
	NRT provision problems. Not receiving the appropriate NRT	✘	✔
	Lack of expertise. Lack of experience regarding smoking cessation in general and during pregnancy	✘	✔
	Accessibility issues. Service not being local, waiting long to get an appointment or getting appointments at inconvenient times	✔	✔
Financial incentives	Problems with getting the vouchers	✔	*N/A*

Specifically, although participants in both groups described the perceived detrimental effects of the *Lack of Support and Advice* from the services and of the *Accessibility Issues*, non-incentivised women described the adverse effects of not receiving the appropriate Nicotine Replacement Therapy (NRT). This was perceived by women in this group as differentially affecting their cessation efforts and was mentioned as resulting from a lack of information on behalf of the services regarding the treatments allowed during pregnancy:

"...she gave me the patch where I wanted the highest patch that I could have because I've been smoking 20 24/7, they actually told me the most I could have was a 20mg patch, which now I've been told by the midwife that's not true….The patch didn't seem to be working. And then when I told my midwife it didn't work and she said it was, erm, that I could have more than a 20mg patch. Where I'd got told that was all I could have… I was pregnant I wasn't allowed the highest dose I could have was the 20mg patch… I wouldn't be smoking now if the pharmacist had given me the right amount" (Participant09, control group)

This NRT-provision problem was also discussed in relation to the services' lack of suggestions regarding alternative aids for women who were experiencing side effects with their existing treatment:

"....patches…because I've got eczema… … and they irritate my skin… No I went back, erm, and I tried the inhalers, but I didn't like them, they give me a sore throat and I didn't like when you suck on them you get a nasty taste in your mouth. .. And I have tried the gum but I don't like them they sort of burn your tongue and that… So I like, sort of run out of options. I didn't know what else I could try really…" (Participant07, control group; 8:16–24; 9:1–9)

It also seems to have stemmed from the specific prescription protocols adopted by the services:

I remember running out [of lozenge] not being able to get an appointment so… Basically my doctor…you'd phone at half eight in the morning it's engaged for ages. By the time you get through you can't get an appointment but now they've changed the rules. The doctor I went to see him last time I said, "Look please I can do it on… it's

going to take me a month to get an appointment with your smoking nurse here" and I said, "can't you just give me the prescription now while I'm waiting?" But he wouldn't."(Participant34, control group; 18:1–18)

Not receiving the appropriate NRT appears associated to smoking cessation counsellors' lack of expertise, which was described as an additional factor inhibiting the efforts of non-incentivised women:

"I said to her, erm, er, yeah about me being pregnant and still carrying the lozenges she's like "Yeah." I said I've got patches at home can I still use them, like can I start on them again rather than give me more, they're from last year they're still in date though? And she said, "I've never dealt with a pregnant woman before."" (Participant34, control group)

This lack of expertise was perceived as generalised and not only in relation to smoking cessation during pregnancy:

"Actually she was actually reading off the form, so it wasn't like she knew it, she was reading it from a book when I kept signing it saying… And she was reading from there about the cravings and how the patch works and if I need to go in and talk to them. She wasn't saying it off her head, she was reading it off a form …[]… I think that's… she didn't know but really that's wrong because they're a pharmacy. Because they're a Stop Smo--… how you can stop smoking they should have all the right information. So I think someone needs to go to them and see if they have got the right information." (Participant09, control group)

The above issues were only raised by women who were not participating in the incentive scheme for cessation. Given that access to NRT was meant to be identical across the two groups, this finding raises questions regarding whether it reflects differences in perception, or actual differences in service provision. These possibilities will be discussed in the next section.

Incentivised women were unique in their descriptions of the inhibiting effects of encountering problems with obtaining the vouchers, which they perceived as having compromised their smoking cessation attempt:

"Well it didn't work very well because the first week we went my voucher came, but it didn't come to my address it came to another address and they sent it on. And then the next time I went to the chemist for the next test I didn't tell him that he hasn't got my address right, and my voucher never came....that put me off then" (Participant19, incentivised group).

Discussion

Women in the two groups reported comparable reasons for wanting to stop smoking during pregnancy. While citing broadly similar factors as influencing their quit attempts, their accounts differed with regards to their experiences of the Stop-Smoking Services. Women who were incentivised described the motivating experience of being monitored and receiving feedback on their progress. Non-incentivised women reported problems receiving the appropriate Nicotine Replacement Therapy, which they described as having a detrimental effect on their cessation efforts.

Reasons for wanting to stop smoking

Although women in the two groups reported similar motivations for trying to stop smoking, the accounts of incentivised women differed with regards to the mention of financial incentives. Attainment of the incentives by those in the incentivised group, however, was not described as a primary reason for attempting to quit smoking, but was referred to as an "added bonus" for doing something they were already motivated to do. The incentives therefore were not described as having an influential role in women's decisions to stop smoking. This is consistent with the findings of a recent investigation showing that the majority of quitters, among non-pregnant smokers, did not consider incentive-attainment as a main reason for quitting smoking (Kim, Kamyab, Zhu et al., 2011). There are three possible explanations for this finding.

Firstly, it may reflect an actual failure of incentives to influence women's motivation to stop smoking. The value of incentives offered in the current scheme was considerably smaller (more than ten-fold less) than that offered in the trials from which there is evidence of effectiveness (Donatelle et al., 2000a; Heil et al., 2008; Higgins et al., 2004). They were also offered as fixed sums at fixed periods of time. Consequently, they may have been too small or offered in a way unlikely to influence motivation or shape new behaviours. Initial impressions of the scheme's effectiveness, however, do not appear to support this explanation: a larger number of women from the incentivised group compared to the non-incentivised group were referred to the Stop-Smoking Services. Although this could in part be attributable to midwives' differential engagement with women from each group, it may also reflect incentivised women's greater willingness to be referred to the services and thus greater motivation to stop smoking.

A second possible explanation for the aforementioned finding is that women were not aware of the effect financial incentives had on their motivation to stop smoking. Indeed, people are often unaware of the processes underlying their thoughts and motivation for their behaviours (Aarts & Dijksterhuis, 2000; Bargh, Lee-Chai, Barndollar et al., 2001; Moskowitz, Li & Kirk, 2004). It is therefore possible that financial incentives influenced women's motivation outside their conscious awareness. The mechanisms by which this could occur are unclear. One hypothesis is that incentives work through increasing positive affect, which can be induced by the provision of money (Meloy, Russo & Miller, 2006) and is considered to have a fundamental role in non-conscious motivation (Aarts, 2007) .

The third explanation for the aforementioned finding is that women were aware of the effect financial incentives had on their motivation to stop smoking but were unwilling to admit it. Smoking during pregnancy is surrounded by social stigma. The majority of people are critical of pregnant smokers and view smoking during pregnancy as an indication of women not taking the responsibilities of motherhood seriously (NHS Leicestershire and Rutland, 2009). As such, pregnant women often perceive pressure to stop smoking (Bondas & Eriksson, 2001), with people feeling that they should do so for medical and social reasons (Bull, Burke, Walsh et al., 2007). The use of financial incentives for health promotion is also surrounded by negative attitudes, with people often finding such interventions unacceptable (Promberger et al., 2011) and arguing that individuals should not be paid to do things they should do anyway (Long & Volpp, 2008). Taken together these negative attitudes may have lead women in the present study to feel pressure to focus more on the health reasons for quitting smoking, such as for the health of their baby and underplay the influence of incentives.

Factors influencing quit attempts

While women in the two groups perceived broadly similar factors as having influenced their quitting efforts, their accounts differed with regards to their dissimilar experiences of the Stop Smoking Services. Incentivised women described the motivating experience of being monitored and receiving feedback on their progress. Non-incentivised women on the other hand described the detrimental effect of not receiving the appropriate Nicotine Replacement Therapy (NRT). There are at least two possible explanations for these differences.

Firstly, given that access to the services and their delivery was meant to be identical across groups, findings may represent a difference in perception that is not reflected in actual delivery of the services. Specifically, differences in women's levels of engagement with the services may have influenced how they perceived them. Repeated exposure to novel stimuli increases liking (Zajonc, 1968). Accordingly, incentivised women's greater use of the services, which appeared related to the provision of incentives, may have led them to focus more on the services' positive aspects. Similarly, the lack of engagement by non-incentivised women may have led them to focus on the negative aspects. Exposure can also have positive effects on affect (Bornstein, 1989; Bornstein & D'Agostino, 1992), which has been shown to influence thinking, and the evaluation of events (Isen, 1993; Isen, 1999; Weiss, Nicholas & Daus, 1999), as well as attitude formation (Kim, Lim & Bhargava, 1998). The provision of money has also been shown to induce positive affect (Meloy et al., 2006). Consequently, differences in perception might have resulted from differences in positive affect. Furthermore, given that affect generated by one stimulus can be transferred to another (Allen & Madden, 1985; Shimp, 1991), the positive affect resulting from incentive-attainment may have generalised to the context in which this occurred, i.e. the Stop-Smoking Services, thus leading incentivised women to perceive the services more positively. If differences in support are perceived, rather than actual, and reflect a differential engagement with the services, then the use of incentives might be effective to the extent that they increase pregnant smokers' involvement with the services.

A second explanation for the aforementioned perceived differences is that they may reflect an actual difference in women's experience of the services. This may have resulted from differential engagement with the services, related to the provision of incentives, as well as differential delivery of the services. The latter may have resulted regardless of the intention to keep the services identical across groups. The incentive scheme was not randomised across services, but rather was provided in different parts of a geographical area in England. It is therefore possible that service delivery differed in these areas. Indeed, it is accepted that Services vary in the types of interventions they choose to provide and their approaches to delivery depending on local circumstances and patients' preferences (Chambers, 2009; Department of Health, 2008). Although guidelines exist with regards to the elements all interventions should include, such as CO monitoring and delivery of progress related feedback (Chambers, 2009), provision of these varies greatly within the NHS Stop Smoking Services (May & McEwen, 2008).

Differences may have also been related to the provision of financial incentives. Incentivised women appeared to be using the services more as a result of the incentives. This greater engagement may have given women in this group more of an opportunity to experience service-related support. Furthermore, because voucher delivery was contingent upon biochemically confirmed smoking cessation, monitoring of smoking behaviour and provision of related feedback from the services might have been more regular for incentivised women. This would explain the absence of these themes from the accounts of non-incentivised women. Moreover, being involved in a programme specifically aimed at pregnant smokers may have led smoking cessation counsellors included in the financial-incentives scheme to receive more education and training about the NRT aids allowed during pregnancy. Absence of such training, due to the lack of involvement with a scheme designed for pregnant smokers, could explain non-incentivised women's experiences of problems with NRT-provision. Indeed, women in this group discussed these problems, in relation to service providers' inadequate knowledge and expertise.

If differences in the delivery of the Stop Smoking Services are actual rather than perceived and if the incentive scheme is shown to be effective in promoting smoking cessation, then one possible explanation would be that its impact is due wholly or in part to increased levels of support from the services, provided in the form of monitoring, progress-related feedback and/or delivery of appropriate NRT. Given the exploratory nature of the current study, in addition to the lack of a formal evaluation of the effectiveness of the incentive scheme, this hypothesis has not yet been tested. Further research is necessary to establish whether the potential effectiveness of financial incentives is indeed mediated by increased levels of support from the services. If this is the case, it may be possible to improve smoking cessation rates by furthering service providers' training and ensuring delivery of regular monitoring and progress-related feedback, rather than providing incentives. However, while there is some evidence to suggest the effectiveness of NRT in reducing smoking in pregnancy (Bauld & Coleman, 2009), biochemical risk assessment, including CO measurement and feedback, does not appear to aid smoking cessation (Bize, Burnand, Mueller et al., 2009). This finding could be taken as an indication that incentivised women's perceptions of the beneficial influence of monitoring and feedback provision, in reality, may not have necessarily affected their cessation success. Further research is necessary to elucidate the role of service-support in the effectiveness of financial incentives for smoking cessation during

pregnancy and to clarify the role of other potentially important variables in the mediation of the impact of financial incentives for smoking cessation during pregnancy.

Strengths and limitations

The present study has certain important strengths. First, it is the first investigation attempting to determine how financial incentive schemes for smoking cessation during pregnancy may have their effects. Consequently, it is the first to explore the experiences and perceptions of pregnant smokers who have been incentivised for cessation and compare them with those of pregnant smokers not receiving incentives. This comparative design allowed for identification and exploration of the factors that are potentially important for smoking cessation during pregnancy. Finally, the strength of this study also lays in the size of its sample: it is one of the largest interview-based studies of pregnant smokers, focusing on the accounts of thirty-six women. This is important as pregnant smokers are an extremely difficult group to recruit and study.

The current study has certain limitations that restrict assessment of how such incentives may be having an effect. First, the qualitative, exploratory nature of the study does not allow for causal relationships to be established. Second, as mentioned previously, the incentives scheme is pending formal evaluation and its effectiveness has yet to be established. At the time the interviews were conducted few women in either group had stopped smoking, thereby precluding comparisons within and between groups between quitters and non-quitters.

Conclusion

Regardless of the above limitations, the findings presented here highlight certain important issues about incorporating financial incentives for smoking cessation during pregnancy into the NHS Stop-Smoking Services. These include the need to be cautious about attributing the effects of financial incentives schemes to incentives *per se*, given that such schemes are complex behavioural interventions that might operate through one or more of various pathways, including by increasing individuals' motivation and self-regulation, by changing their engagement with and provision of support services, or a combination of these.

The next chapter

The next chapter presents the protocol for Study 3, a randomised controlled trial further examining the effectiveness of financial incentives in changing health-related behaviours by assessing their impact on uptake of the HPV vaccination. The study also examines the modifying role of recipients' deprivation level and assesses the potentially adverse consequences of incentives on decision quality.

Chapter 6

Using financial incentives to increase initial uptake and completion of HPV vaccinations: protocol for a randomised controlled trial

Abstract

Background: HPV vaccination reduces the risk of cervical cancer. Uptake, however, of the 'catch-up' campaign in England for 17-18 year old girls is below the 80% NHS target. The aim of this randomised controlled trial is to assess the impact of financial incentives on (a) the uptake and completion of an HPV vaccination programme and (b) the quality of the decisions to undertake the vaccination. It also aims to assess whether any impact on uptake is moderated by participants' deprivation level.

Method/Design: One thousand (n=1000) 16-18 year-old girls will be invited to participate in an HPV vaccination programme: Five-hundred (n=500) will have received a previous invitation to get vaccinated but will have failed to do so (previous non-attenders) and 500 will not have previously received an invitation (first-time invitees). Girls will be randomly selected from eligible participants who are registered with a GP in areas covered by the Birmingham East and North (BEN) and Heart of Birmingham Primary Care Trusts. The two samples of girls will be randomised to receive either a standard vaccination invitation letter or an invitation letter including the offer of vouchers worth £45 for receiving three vaccinations. Girls will also complete a questionnaire to assess the quality of their decisions to be vaccinated. The primary outcome will be uptake of the 1st and 3rd vaccinations. The secondary outcome will be the quality of the decisions to undertake the vaccination, measured by assessing attitudes towards and knowledge of the HPV vaccination.

Discussion: The key results will be: a) the effectiveness of financial incentives in increasing uptake of the 1st and 3rd vaccinations; b) the role of participants' socio-economic status in the moderation of the impact of incentives on uptake; and c) the impact of incentives on the quality of decisions to undertake the HPV vaccinations.

Mantzari, E., Vogt, F., & Marteau, T.M. (2012). Using financial incentives to increase initial uptake and completion of HPV vaccinations: protocol for a randomised controlled trial, *BMC Health Services Research 2012*, **12:**301 doi:10.1186/1472-6963-12-301 (*Appendix 6.1*)

Background

Human Papillomavirus (HPV) is an ubiquitous sexually transmitted virus that could lead to cervical cancer (Brabin, Fairbrother, Mandal et al., 2005; Moscicki, Shiboski, Broering et al., 1998). HPV vaccines help prevent infection by some of the most common forms of HPV that are associated with later development of cancer (Harper, Franco, Wheeler et al., 2004; Villa, Costa, Petta et al., 2005). The HPV immunisation process takes six elapsed months and is conducted in three stages: 1st vaccine, 2nd vaccine two months later, and a 3rd vaccine six months after the first vaccination. Completion of all three vaccinations is necessary to effectively reduce the risk of cervical cancer (Garland, Hernandez-Avila, Wheeler et al., 2007). The degree of protection afforded by incomplete immunisation is currently unknown (Widdice, Bernstein, Leonard et al., 2011).

Since September 2008 a national programme has started in England and Wales aiming to vaccinate girls aged 12-13 against HPV. A two-year 'catch-up' campaign that offers the HPV vaccine to 17-18 year old girls has also been initiated. The objective of these HPV vaccination programmes is to provide three doses of the HPV vaccine to females before they become sexually active, when the risk of HPV infection and subsequent cervical cancer development increases. It is estimated that if this objective is met and vaccination coverage is sufficiently high (80% of the target population), up to 400 deaths per year in England could be prevented (Sheridan, White, Barlow et al., 2010). Although the national programme in England aimed at 12-13 year-old girls has resulted in high uptake (88.1% uptake of the first vaccination and 80.1% of the third vaccination), the uptake rates for the "catch-up" campaign in England (targeting 17-18 year olds) have been lower, with 62.2% of the target group receiving the first dose and 31.8% the third (Sheridan et al., 2010).

Offering girls financial incentives to undergo the HPV vaccination could increase these uptake rates. Incentive mechanisms are increasingly being considered and used in health care policy in the UK and elsewhere in an attempt to change health-related behaviour (Lagarde et al., 2007; Le Grand, 2008). They are most effective in changing 'simple', 'one-off behaviours' such as getting vaccinated (Achat, Mcintyre & Burgess, 1999; Beith, Eichler & Weil, 2007). Their effectiveness, however, has been predicted to vary with recipients' level of social deprivation. Specifically, it has been argued that financial

incentives should be more effective for the most socially deprived (Sutherland et al., 2008). Most of the calls, to use incentives in HPV vaccination programmes in the UK have so far focused on incentivising those providing the vaccination (e.g. GPs) rather than vaccination recipients (Tanday, 2008). Their effectiveness therefore in this context is currently unknown. Furthermore, no studies have assessed the role of social deprivation in the moderation of their impact on vaccination uptake.

Even if effective in improving uptake of the HPV national programme, the use of financial incentives raises concerns about the possible adverse effects they may have on the quality of people's decisions to engage in incentivised behaviours. For example, it has been argued that the prospect of receiving a financial reward could result in the risks associated with a particular health behaviour being overlooked (Marteau et al., 2009). To date, however, no known studies have assessed the mechanisms by which financial incentives influence the decision-making processes involved in engaging in an incentivised health behaviour.

In summary, further research is needed to determine the impact of financial incentives upon first, uptake of the HPV vaccination, and second, the quality of recipients' decisions to get vaccinated. Furthermore, research is needed to determine the role of social deprivation in the moderation of the impact of financial incentives on uptake of vaccinations.

Objectives and hypotheses

The primary objectives of the present study are:

a) To assess the impact of financial incentives on the initial uptake (uptake of the first vaccination) and completion rates (uptake of the third vaccination) of an HPV vaccination programme

b) To assess the impact of financial incentives on the quality of the decision to be vaccinated, as measured by attitudes towards and knowledge of the vaccination.

The secondary objective is:

a) To assess whether the impact of financial incentives on the initial uptake and completion rates of an HPV vaccination programme is moderated by participants' levels of social deprivation.

Hypothesis I

Those offered financial incentives to get vaccinated against HPV are more likely to receive the first and third HPV vaccinations.

Hypothesis II

The effect of incentives on uptake of the first and third vaccinations will be moderated by participants' levels of social deprivation, with larger effects of the incentives being observed for the most socially deprived

.

Hypothesis III

Offering financial incentives reduces the quality of decisions to get vaccinated against HPV.

Methods/Design

Trial design

This is a randomised controlled trial in which two independent samples of participants are separately randomised to the offer of financial incentives for getting vaccinated.

Participants

Participants will compromise of 16-18 year old girls, living in Birmingham. To be included in the trial, girls must fulfil the following inclusion criteria:

a) Live in areas falling under the administration of the Birmingham East and North (BEN) and the Heart of Birmingham Primary Care Trusts
b) Be registered with a GP within one of the two PCTs
c) Be eligible to be vaccinated through the clinics (Sutton Cottage, Partners in Health and Dove Medical Centre)
d) Not have been vaccinated against HPV before.

Half of the sample will consist of girls who have previously received an invitation to get vaccinated, but have failed to attend the first appointment (previous non-attenders). The remaining half will consist of girls who have not yet received an invitation to attend the vaccination programme (first-time invitees).

Intervention

The components of the intervention used in the present HPV vaccination programme are:

Invitation letters

All participants will receive letters inviting them to attend their first HPV vaccination session. These will be sent, on behalf of the Birmingham East and North and Heart of Birmingham Primary Care Trusts, and will include the date, time and location of the allocated appointments (*Appendix 6.2*)

Reminder text messages

Participants attending their first vaccination appointment will be asked to inform the researchers of their mobile phone numbers. These will be used to send text messages reminding them of their subsequent vaccination appointments. These will be sent during the intervals between the first and second vaccinations and the second and third vaccinations and two days prior to the next session. An example of the wording of these messages is: *"(Name), don't forget your HPV jab at (date and time) at the (venue). Thank you"*.

Offer of financial incentives

Participants from the two samples (i.e. previous-non-attenders and first-time invitees) allocated to the incentivised groups will receive a modified version of the standard vaccination invitation letter, described above, which will include the offer of vouchers worth £45 for receiving the three vaccinations. Specifically, participants will be informed that they will receive:

£20 for the first vaccination

£5 for the second vaccination

£20 for the third vaccination

Procedure

The trial will be run by the Birmingham East and North Primary Care Trust in collaboration with Healthy Incentives (www.healthyincentives.org.uk/, a social enterprise arising as a result of a partnership between the Young Foundation and the Birmingham East and North Primary Care Trust). The Birmingham East and North PCT has employed the Birmingham Primary Care Shared Services Agency (BPCSSA) to do the following: select participants to be included in the trial; randomise them to each group and post the invitation letters. Once the letters have been sent, the BPCSSA will provide the Healthy Incentives team with the details of all the participants who have been invited, including their names, addresses, scheduled vaccination dates, the participant group (previous non-attender or previously not invited) and randomisation group (incentive or not). The vaccinations for all individuals will take place at three community clinics (*Appendix 6.3*). The BPCSSA will schedule a number of 'incentivised only' sessions at these clinics to avoid any tensions caused by not incentivising all groups. Vaccinations will be carried out by nurses working with Heart

of Birmingham (HOB). When attending their first vaccination session and while waiting to get vaccinated, participants will be asked to sign a consent form and complete a measure assessing the quality of their decision to get vaccinated (*Appendix 6.4*). They will also be requested to select a date for their next vaccination. Receipt of each vaccination will be contingent on completion of all the previous doses (i.e. in order to receive the 3rd vaccination participants will need to have first completed the 1st and 2nd vaccinations), with no skipping of doses being allowed. After receiving their vaccinations, participants in the incentivised groups will be provided with the appropriate shopping vouchers. Two days prior to their 2nd and 3rd vaccination sessions, the Healthy Incentives team will send participants text messages reminding them of their appointments.

Participant recruitment and randomisation

To be included in the study, participants will be selected randomly from a list of names of all girls aged 16-18 years, meeting the above inclusion criteria (See Figure 6.1). This list will be compiled by the Birmingham Primary Care Shared Services Agency (BPCSSA), which holds and controls all Birmingham patient data, from the names of all 16-18 year old girls eligible to be vaccinated against HPV. The list will be sorted according to whether girls have received a previous invitation to get vaccinated but have failed to attend their first session or have not previously received an invitation. BPCSSA will randomly select 500 participants to be included in the trial from each of these two sub-lists using the RAND() function in Excel. Selected individuals from both the samples will subsequently be separately randomised, via the aforementioned technique, to receive one of two invitations letters (*Appendix 6.2*):

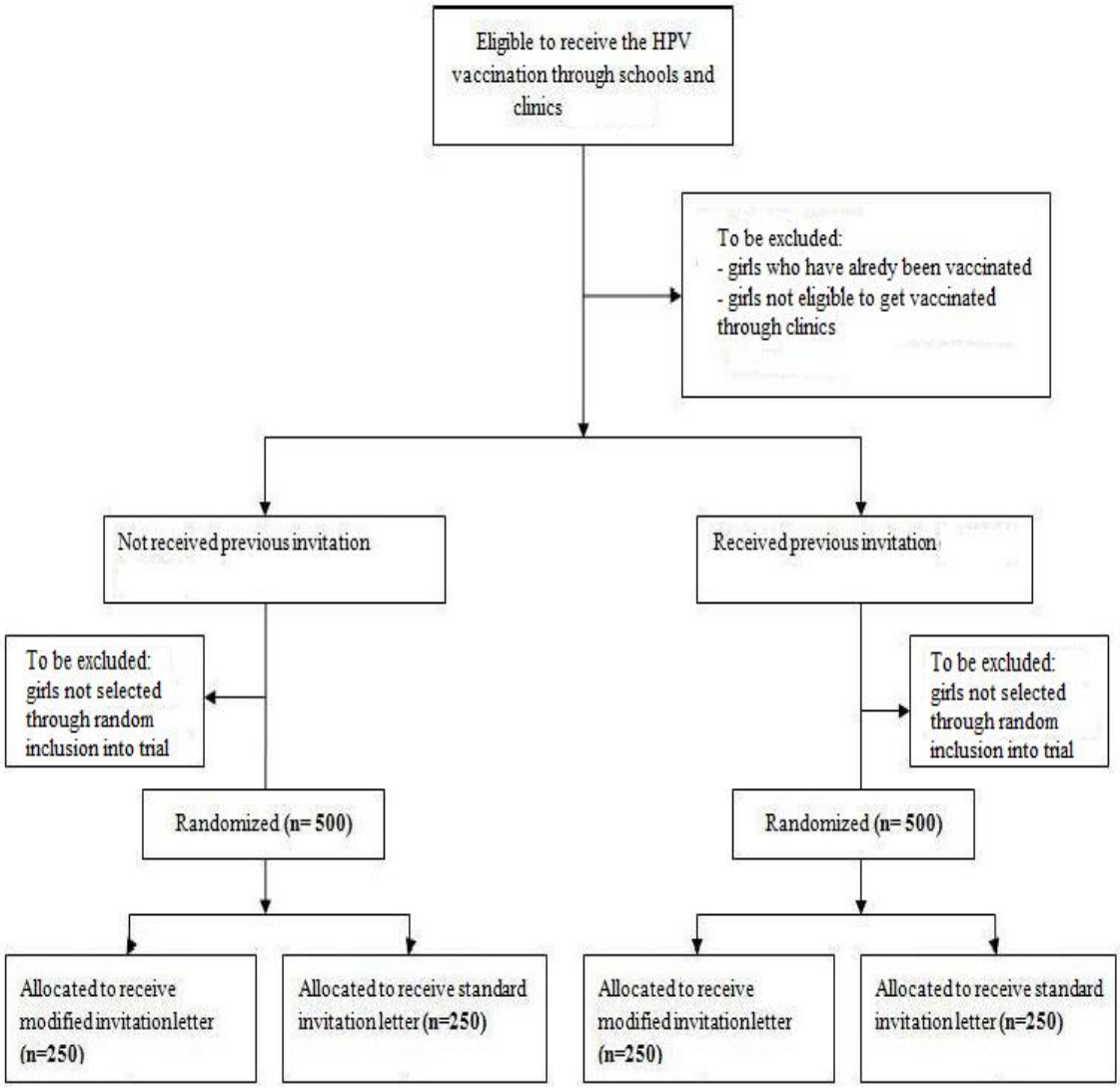
a) A standard letter inviting them to attend their first vaccination session, or
b) A modified invitation letter, which will include the offer of vouchers worth £45 for receiving the three vaccinations

This will result in the groups presented in Table 6.1

Table 6.1 Incentivised and control groups

	Receiving invitation for 1st time	**Having received an invitation previously**
Control Group	250 (receiving standard invitation letters; no incentives)	250 (receiving standard invitation letters; no incentives)
Intervention Group	250 (receiving modified invitation letters; incentives)	250 (receiving modified invitation letters; incentives)

Figure 6.1. Recruitment and randomisation of participants.



Outcomes

Uptake

Uptake of each vaccination by participants will be recorded at the community clinics where vaccinations will take place.

Social deprivation

Levels of social deprivation will be measured by using participants' postcodes to calculate Index of Multiple Deprivation (IMD) scores. This is a measure of multiple deprivation measured at the small area level, i.e. the Lower Layer Super Output Area (LSOA). It is made up of seven LSOA level domain indices, which relate to income

deprivation, employment deprivation, health deprivation and disability, education skills and training deprivation, barriers to housing and services, living environment deprivation, and crime. IMD scores range from 0.37 (least deprived) to 85.46 (most deprived) (Community and Neighborhoods, 2007).

Informed choice

In order to assess whether the offer of financial incentives undermines the quality of decisions to undertake the HPV vaccinations, a short modified version of a validated measure of informed choice will be used (Marteau et al., 2001). This will consist of:

1. two items rated on a seven point scale, assessing attitudes towards the HPV vaccination: "For me, having the HPV vaccination is (a) 1: not at all good −7: extremely good and (b) 1: not at all harmful-7: extremely harmful."
2. three items assessing knowledge of the HPV vaccination by requesting participants to determine the validity (whether true or false) of three statements relating to the vaccination: "If I have the HPV vaccination: I am less likely to get cervical cancer**;** I am less likely to get other sexually transmitted diseases; I am less likely to get pregnant"

Sample size determination

According to the latest report from the Department of Health on coverage of the HPV vaccinations (Sheridan et al., 2010) the average completion rate for the "catch-up" campaign targeting females aged 17-18 years in the Birmingham East & North Primary Care Trust is 32.4%. Previous studies investigating the impact of financial incentives on uptake of vaccinations have reported an average between-group difference of approximately 8.5%: Specifically, Moran, Nelson, Wofford et al. (1996) reported an effect size of 8.5% for uptake of the influenza vaccination with incentives (20.3% (control group) vs. 28.8% (incentivised group)) and Yokley & Glenwick (1984) reported an average increase of 8.4% in childhood immunisation across three time points with the addition of incentives (at two weeks: 10.1% (control group) vs. 22.5% (incentivised group); at 2 months: 22.7% (control group) vs. 30.8% (incentivised group); at three months: 26% (control group) vs. 30.8% (incentivised group)). Based on these figures, we expect financial incentives in this study to increase completion (i.e. uptake of the 3rd vaccination) of the HPV vaccination programme by 8.5%, resulting in

a completion rate of 40.9% by incentivised groups. To detect this difference between arms using a two-tailed χ^2 test at the 5% significance level with 80% power, a sample of 1008 participants is required (calculations performed in GPower 3.0). This figure has been rounded off to the nearest whole number, resulting in a required sample of 1000 participants (half of whom consist of previous-non-attenders and half of whom, first-time invitees), giving 500 in each intervention arm (See Table 6.1)

Evaluation

The evaluation of the financial incentive scheme will be conducted by researchers at King's College London, Centre for the Study of Incentives in Health (CSI Health, www.kcl.ac.uk/csihealth). Data relating to participants' uptake of each of the three HPV vaccinations, along with their postcodes, age and answers to the measure of informed choice will be transferred by the Healthy Incentives team to CSI Health researchers. All information will be anonymised and kept securely. Data will be transferred via email in password protected files. CSI Health researchers will analyse the data with the aim of: i) determining the impact of financial incentives on uptake of the HPV vaccination and on the quality of girls' decisions to get vaccinated; and ii) writing up and publishing the findings.

Statistical analysis

To assess the impact of the intervention on initial uptake (i.e. the 1st vaccination) and completion of the HPV vaccination programme (i.e. the 3rd vaccination) logistic regressions will be performed separately for each of the two samples, i.e. for girls who have not received an invitation to get vaccinated before and those who have received a previous invitation but have failed to attend. To test the moderating effect of social deprivation on the impact of the intervention, the interaction between IMD scores and intervention will be added to the logistic regression models. To test whether there is a difference in the size of effect of the intervention in the two samples, datasets will be combined and another logistic regression conducted, in which whether participants have received an invitation to get vaccinated before or not will be added as a predictor to the model, along with the intervention. To test for differences in the attrition rates between the 1st and 3rd vaccinations between the intervention and control groups, the χ^2 test will be used. Finally, differences in knowledge of the HPV vaccination between intervention and control groups will be tested using the χ^2 test, while differences in attitudes towards

the HPV vaccination will be examined via a one-way analysis of variance. All tests will be assessed at the 5% level of significance.

Discussion

The results of the study will produce valuable information regarding the potential effectiveness of financial incentives in increasing uptake and completion of the HPV vaccinations by teenage girls. The results will also provide valuable information regarding the validity of concerns about the potentially adverse effects of financial incentives on the quality of people's decisions to engage in incentivised behaviours. If evidence from this trial supports such concerns, further research will be needed to assess how incentives might undermine informed choice, e.g. whether they alter who attends or whether they alter the attitudes towards and/or knowledge of the target behaviour in all who are offered incentives and therefore in those who attend. The design of the present trial does not allow for such assessments to be made.

Knowledge regarding the impact of financial incentives both on uptake of the HPV vaccination and on the quality of decisions to engage in incentivised behaviours is lacking in the literature. Findings therefore, are expected to clarify these issues and have the potential to inform discussions concerning the increasing use of financial incentives for health promotion

The next chapter

This chapter presented the protocol for Study 3, the randomised controlled trial assessing the impact of financial incentives on uptake of the HPV vaccination and the quality of decisions to get vaccinated. The following chapter presents the findings for Study 3.

Chapter 7

Financial incentives for increasing uptake of HPV vaccinations: a randomised controlled trial

Abstract

Objective: Uptake of the HPV vaccinations by 17-18 year-old girls in England is below (<35%) target (80%). This trial assesses (a) the impact of financial incentives on uptake and completion of an HPV-vaccination programme and (b) whether any impact is moderated by participants' deprivation level. The trial also assesses the impact of financial incentives on the quality of decisions to get vaccinated.

Methods: One-thousand 16-18 year-old girls were invited to participate in an HPV-vaccination programme, of whom 500 had not been invited before, and 500 were unresponsive to previous invitations. Girls in both groups were randomised to receive either a standard invitation letter or a letter including the offer of vouchers worth £45 (€56; $73) for undergoing three vaccinations. Girls attending their 1st vaccination appointment completed a questionnaire assessing the quality of their decisions to be vaccinated. The outcomes were uptake of the 1st and 3rd vaccinations and decision quality.

Results: The intervention increased uptake of the 1st vaccination (first-time invitees: 28.4% vs. 19.6%; *OR* 1.63, *CI 95%* 1.08-2.47; previous non-attenders: 23.6% vs. 10.4%; *OR* 2.65, *CI 95%* 1.61-4.38), and 3rd vaccination (first-time invitees: 22.4 % vs. 12%; *OR* 2.15, *CI 95%* 1.32-3.50; previous non-attenders: 12.4% vs. 3%; *OR* 4.28, *CI 95%* 1.92-9.55).). Impacts were not moderated by participants' deprivation level. The quality of decisions to get vaccinated was unaffected by the intervention.

Conclusions: Although the intervention increased completion of the HPV vaccinations, uptake remained lower than the national target which, in addition to cost-effectiveness and acceptability issues, necessitates consideration of other ways of achieving it.

Trial registration: Current Controlled Trials ISRCTN 52339409

Mantzari, E., Vogt, F., & Marteau, T.M. (in press). Financial incentives for increasing uptake of HPV vaccinations: a randomized controlled, *Health Psychology*

Background

Human Papillomavirus (HPV) is an ubiquitous sexually transmitted virus that could lead to cervical cancer (Brabin et al., 2005; Moscicki et al., 1998), the second most common cancer in women worldwide (Ferlay, Shin, Bray et al., 2010). HPV vaccines help prevent infection with `high-risk' strands of HPV that are associated with later cancer development (Ault, 2007; Franco & Harper, 2005). Immunisation against HPV requires completion of three vaccinations to effectively reduce the risk of cervical cancer (Ault, 2007; Joura, Leodolter, Hernandez-Avila et al., 2007). The degree of protection afforded by incomplete immunisation is currently unknown (Widdice et al., 2011).

Since September 2008, a national programme has been implemented in England and Wales, UK, aiming to vaccinate girls aged 12-13 years against HPV. A two-year 'catch-up' campaign targeting 17-18 year-old girls has also been initiated. The objective of these vaccination programmes is to provide three doses of the HPV vaccine to females before they become sexually active, when the risk of HPV infection and subsequent cervical cancer development increases. It is estimated that if this objective is met and vaccination coverage is sufficiently high (80% of the target population), up to 400 deaths per year in England could be prevented (Sheridan et al., 2010). Although the national programme targeting 12-13 year-olds has met the 80% uptake target set by the National Health Service (NHS), with 88.1% of girls receiving the 1st vaccination and 80.1% the 3rd, the 'catch-up' campaign targeting 17-18 year-olds has resulted in below-target uptake, with 62.2% of girls receiving the 1st vaccination and only 31.8% the 3rd (Sheridan et al., 2010). Apart from these cohort differences, uptake of the HPV vaccine in England is also marked by social inequalities, with girls living in deprived areas and from ethnic minority backgrounds being less likely to get vaccinated (Roberts, Brabin, Stretch et al., 2011). Women from these populations are also more likely to develop cervical cancer (Shack, Jordan, Thomson et al., 2008).

Offering girls financial incentives to undergo the HPV vaccination could increase uptake rates. Financial incentives are increasingly being considered and used in health care policies in the UK and elsewhere, in an attempt to improve health (Lagarde et al., 2007; Le Grand, 2008). They are most effective in promoting 'one-off' behaviours, such as getting vaccinated (Achat et al., 1999; Seal, Kral, Lorvick et al., 2003; Sutherland et

al., 2008). Indeed, findings from systematic reviews suggest that financial incentives can increase uptake of recommended vaccinations by both adults and children (Briss, Rodewald, Hinman et al., 2000; Giuffrida & Torgerson, 1997; Kane et al., 2004; Ndiaye, Hopkins, Shefer et al., 2005; Stone, Morton, Hulscher et al., 2002; Sutherland et al., 2008). Their effectiveness is predicted to depend on recipients' level of social and material deprivation. Consequently, one potential advantage of using financial incentives to promote health is that they may be more effective in motivating behaviour change in the most socially deprived (Sutherland et al., 2008). When applied to HPV-vaccination programmes, incentives therefore, have the potential not only to improve the below-target uptake rates, but also to reduce health inequalities. Most of the calls to use incentives in HPV-vaccination programmes in the UK, however, have focused on incentivising vaccination providers (e.g. General Practitioners) rather than vaccination recipients (Tanday, 2008). The effectiveness of financial incentives in this latter context therefore, is currently unknown. Furthermore, no studies have assessed the role of social deprivation in the moderation of the impact of financial incentives on vaccination uptake.

Even if effective in increasing uptake of HPV vaccinations, the use of financial incentives in HPV-vaccination programmes will need to be considered in the context of their possible negative consequences. Unlike most interventions designed to change behaviour, the use of financial incentives raises particular concerns regarding their potentially adverse effects on the quality of people's decisions to engage in incentivised behaviours. For example, it has been argued that the prospect of receiving a financial reward could result in the risks associated with the incentivised behaviour being overlooked (Marteau et al., 2009). This is particularly relevant to behaviours associated with physical and/or psychological side-effects, such as getting vaccinated. To date, no known studies have assessed the impact of financial incentives on the quality of decisions to engage in incentivised behaviors.

One way to judge the quality of a decision to engage in a behaviour is to assess whether it represents an informed choice. An informed choice has been operationally defined as one which is based on knowledge of the relevant information, is consistent with the decision-maker's values and is behaviourally implemented (Marteau et al., 2001). These three dimensions of informed choice are also echoed in definitions of informed decision-making (Bekker, Hewison & Thornton, 2004; Dowie, 2002; Irwig, McCaffery,

Salkeld et al., 2006; Jepson, Hewison, Thompson et al., 2005; Rimer, Briss, Zeller et al., 2004) and clinical decision quality (Sepucha, Fowler & Mulley, 2004). Using this operationalisation a multi-dimensional measure of informed choice has been developed (Marteau et al., 2001), validated (Michie, Dormandy & Marteau, 2002) and used to assess the quality of decisions in the context of screening (e.g. Dormandy, Michie, Hooper et al., 2006; Dormandy, Tsui & Marteau, 2007; Jaques, Sheffield & Halliday, 2005; Kellar, Sutton, Griffin et al., 2008; Mathieu, Barratt, Davey et al., 2007; Michie, Dormandy & Marteau, 2003; Smith, Trevena, Simpson et al., 2010). Given that both screening and vaccination uptake involve preventative behaviours with potential side-effects, this measure can readily be used to assess decision quality in the context of HPV vaccination uptake.

The present study is the first worldwide trial which addresses the aforementioned uncertainties with regards to the use of financial incentives in HPV vaccination programmes. The specific aims of this trial are: (a) to assess the impact of financial incentives on initial uptake and completion of an HPV-vaccination programme and (b) to examine whether the impact of financial incentives on uptake and completion of an HPV-vaccination programme is moderated by recipients' level of social deprivation. The trial further aims to assess the impact of financial incentives on the quality of decisions to be vaccinated.

It was hypothesised that girls who were offered financial incentives to get vaccinated against HPV would be more likely to receive the first and third HPV vaccinations. Participants' level of social deprivation was hypothesised to moderate the effects of financial incentives on uptake of the first and third HPV vaccinations, with larger effects of the incentives being predicted for the most socially deprived. In line with existing concerns, it was further hypothesised that the offer of financial incentives would reduce the quality of girls' decisions to get vaccinated against HPV.

Methods

Further details of the study methods are available in the trial protocol (Mantzari, Vogt & Marteau, 2012b).

Context

Between 2008/09 the uptake rates in England for the "catch-up" HPV-vaccination campaign targeting females aged 17-18 years was 62.2% for the 1st vaccination, 54.2% for the 2nd vaccination and 31.8% for the 3rd vaccination (Sheridan, et al, 2010). The equivalent figures for the Birmingham East and North (BEN) Primary Care Trust, where this trial was conducted, were 72.2%, 64.6% and 34.2% (Sheridan et al., 2010).

Trial Design

This is a parallel-group randomised controlled trial.

Participants

Participants were one thousand (n=1000) 16 – 18 year-old girls: five-hundred (n= 500) had not yet received an invitation to attend the vaccination programme (first-time invitees) and five-hundred (n= 500) had previously received an invitation to get vaccinated, but had failed to attend the first vaccination appointment (previous non-attenders). All girls lived in Birmingham, UK and were:

1. registered with General Practitioners within the Birmingham East and North and Heart of Birmingham Primary Care Trusts
2. eligible to be vaccinated through the participating community clinics (Sutton Cottage, Partners in Health and Dove Medical Centre)
3. had not been vaccinated against HPV before.

Recruitment and Randomisation

Participants were selected randomly from a list of names of all girls aged 16-18 years registered with participating General Practitioners (Figure 7.1). After excluding girls not meeting the inclusion criteria, the list was sorted according to whether girls were first-time invitees or previous non-attenders. Five-hundred girls were randomly selected from each of these two sub-lists for inclusion in the trial, using the RAND () function in

Excel and were then randomised via the same technique to control vs. intervention conditions (Table 7.1).

Figure 7.1. CONSORT Flow Diagram

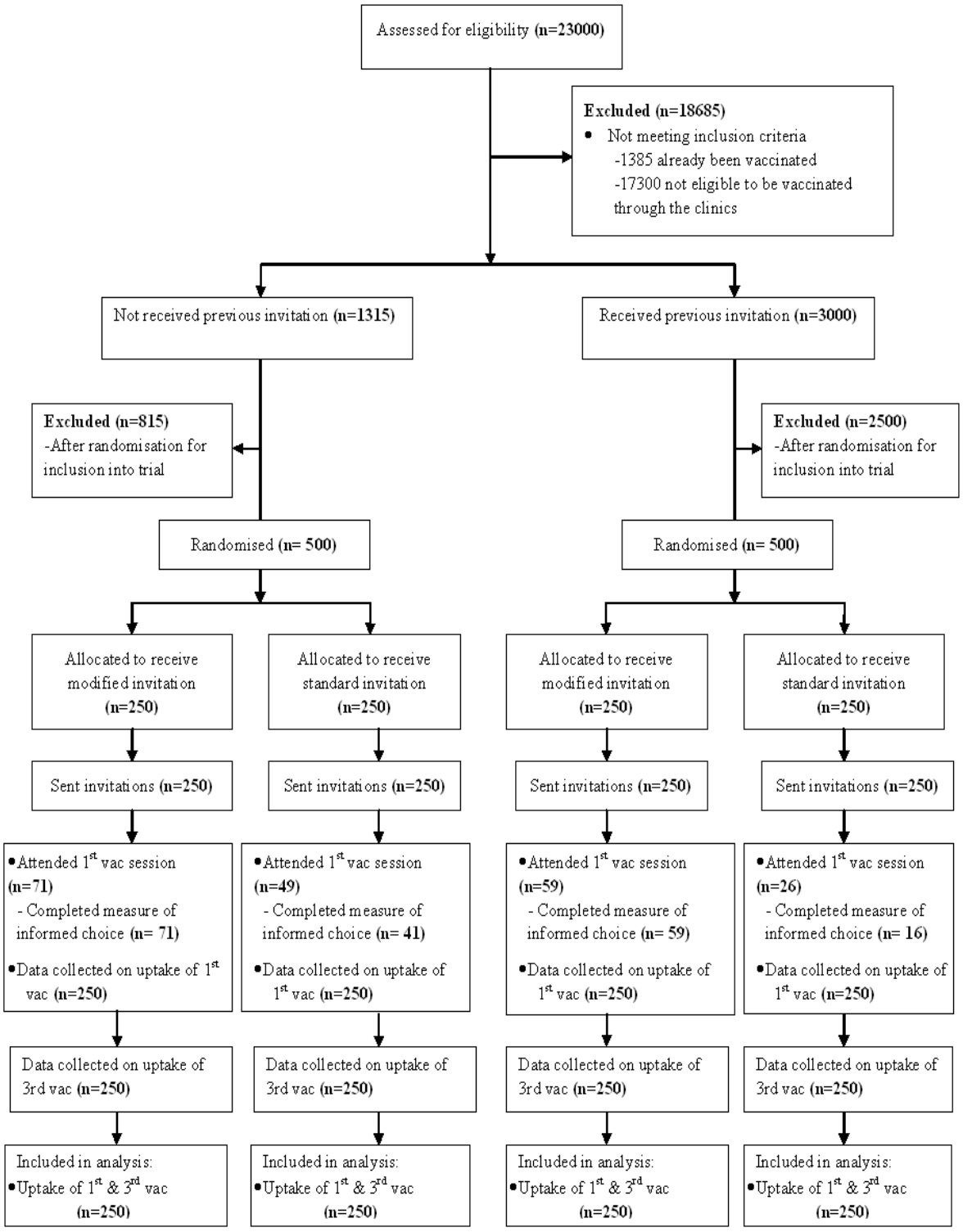


Table 7.1. Description of trial groups

	First-time invitees	Previous non-attenders
Control Group	250 (sent standard invitation letters; no incentives)	250 (sent standard invitation letters; no incentives)
Intervention Group	250 (sent modified invitation letters; incentives)	250 (sent modified invitation letters; incentives)

Intervention

Invitation letters. All participants received letters, addressed to them, inviting them to attend their 1st HPV vaccination session. The letters included the date, time and venue of their allocated vaccination appointment. Participants were given the option to reschedule their appointment or attend a different immunisation clinic by contacting the immunisation team on a designated telephone number, included in the letter *(Appendix 6.2)*

Information leaflet. Along with the invitation letters, all participants were sent a leaflet containing information about HPV and the HPV vaccine. This was the standard leaflet used and distributed by the NHS. It included information on the prevalence of HPV (i.e. that it is common, with most people getting infected at some point in their life), on how it spreads (i.e. through sexual activity with somebody who has the virus), on the different types of HPV that exist and their relationship to cervical cancer (i.e. that more than 100 types of HPV exists but only 13 are known to cause cancer, with others being harmless or causing conditions such as genital warts), on the benefit of the HPV vaccine (i.e. that it reduces the risk of getting cervical cancer by 70%), on the limited protection afforded by it (i.e. that it protects against only the two types of the virus most often linked to cancer, but not against others or other sexually transmitted diseases and does not prevent pregnancy), as well as on the consequences of getting vaccinated (i.e. the vaccine's side-effects – described as few and mild—and the continued need to undergo cervical cancer screening in the future). Participants wishing to obtain further information were directed to the relevant NHS website (www.immunusation.nhs.uk/hpv).

Offer of financial incentives. Participants in the intervention groups received an invitation letter, which included the offer of *Love2Shop* vouchers worth £45 (€52; $65)

for receiving the three vaccinations *(Appendix 6.2)***.** The vouchers could be exchanged at numerous stores in the UK, including general merchandise and department stores, fashion and footwear retailers, specialist retailers (e.g. bookstores), jewelry shops, sports, outdoor and motoring stores, home improvement and soft furnishing stores, restaurants and leisure facilities (e.g. cinemas). The total amount was based on the only existing study of which we are aware, which assessed the impact of incentives on uptake of a vaccination requiring completion of three doses (Seal et al., 2003). In this study participants were offered $60 (£40) for receiving three doses of the Hepatitis B vaccine ($20 for each dose). Unlike this study however, which offered fixed-value rewards for each vaccination, participants in the present study were offered larger rewards for receiving the 1st and 3rd vaccination in an attempt to motivate initiation and completion of the vaccination programme. Specifically, they were offered £20 (€23; $29) for receiving the 1st vaccination; £5 (€6; $7) for the 2nd vaccination; and £20 (€23; $29) for the 3rd vaccination. The exact amounts offered for each vaccination were chosen through discussion with experts.

Reminder text messages. Participants in the intervention groups received text messages reminding them of their 2nd and 3rd vaccination sessions. These were sent during the intervals between the 1st and 2nd vaccinations and the 2nd and 3rd vaccinations and two days prior to the next session. An example of the wording of these messages was: "(Name), don't forget your HPV jab on (day) at (time) at the (venue). Thank you". Participants were not able to reply to these messages. Due an error made by the administration team running the incentive scheme, participants in the control groups did not receive these reminder text messages.

Outcome Measures

Uptake

Uptake of each vaccination was recorded at the community clinics where vaccinations took place and was measured as the proportion of those invited who received each vaccination.

Social deprivation

Area level social deprivation was measured using participants' postcodes to calculate English 2007 Index of Multiple Deprivation (IMD) scores, which range from 0.37 (least

deprived) to 85.46 (most deprived) (Community and Neighborhoods, 2007). The Index of Multiple Deprivation is a measure of deprivation in England based on area of residence. It measures deprivation at the small area level, i.e. the Lower Layer Super Output Area (LSOA). It is derived from seven indices of deprivation, including income, employment, health deprivation and disability, education skills and training, barriers to housing and services and crime. These are combined into a single deprivation score for each small area in England.

Quality of decisions to undergo vaccinations

To assess the impact of financial incentives on the quality of decisions to undertake the HPV vaccinations, a short modified version of a validated measure of informed choice was used (Marteau, et al, 2001), consisting of:

1. two items rated on a seven point scale, assessing attitudes towards the HPV vaccination: "For me, having the HPV vaccination is (a) *1*: not at all good –*7*: extremely good and (b) *1*: not at all harmful-*7*: extremely harmful".
2. three items assessing knowledge of the HPV vaccination. These requested participants to determine the validity (whether true or false) of three statements relating to the vaccination: "If I have the HPV vaccination: I am less likely to get cervical cancer; I am less likely to get other sexually transmitted diseases; I am less likely to get pregnant"**.**

Girls were also requested to state their main reason for getting vaccinated.

The original measure of informed choice was developed for use in the context of prenatal screening and consists of eight items assessing knowledge and four items assessing attitudes (Marteau et al., 2001). The component scales have been shown to have good internal consistency, predictive validity and discriminant validity (Michie et al., 2002). For the purposes of the present study, the knowledge items were adapted to assess awareness of the most important issues regarding uptake of the HPV vaccination, including the vaccine's benefits and limited protection, which were highlighted in the information leaflet participants received. Their importance in comparison to the other information presented in the leaflet was judged and determined by a panel of experts. In order to reduce response burden, only three knowledge items were included (Cronbach's alpha= 0.64). Similarly, only two out of the four original attitude items were chosen for inclusion, one assessing affective attitudes ("For me, having the HPV

vaccination is *1*: not at all good –*7*: extremely good) and one assessing instrumental attitudes (For me, having the HPV vaccination is *1*: not at all harmful-*7*: extremely harmful"). These were adapted from the original scale through rephrasing (Cronbach's alpha= 0.63).

Procedure

The financial incentive scheme was run by the Birmingham East and North Primary Care Trust (in partnership with the Young Foundation). Participants were selected and recruited into the scheme by the Birmingham Primary Care Shared Services Agency, who holds and controls all patient data in Birmingham, UK. Recruitment took place between February and March 2010.

The vaccination sessions were conducted at three community clinics (Sutton Cottage, Partners in Health and Dove Medical Centre) between March and September 2010, by nurses working with Heart of Birmingham Primary Care Trust. When attending their 1st session, participants signed a consent form, completed the measure of informed choice (*Appendix 6.4*) and selected a date for their next vaccination. Delivery of each vaccination was contingent on completion of all previous doses. After getting vaccinated, participants in the intervention groups were handed the appropriate vouchers.

This study was approved by the Birmingham East and North Research Ethics Committee (reference 11/WM/0073)

Statistical Analysis

To assess the impact of the intervention on initial uptake (i.e. uptake of the 1st vaccination) and completion of the HPV-vaccination programme (i.e. uptake of the 3rd vaccination) logistic regressions were performed seperately for first-time invitees and previous non-attenders. To test the moderating effect of social deprivation on the impact of the intervention, the interaction between IMD scores and intervention was added to the logistic regression models. To test whether there was a difference in the effect size of the intervention in the two samples, datasets were combined and another logistic regression was conducted, in which sample (i.e. first-time invitees vs previous non-attenders) was added as a predictor to the model, along with the intervention. The χ^2 test

was used to test for differences in attrition rates from the 1st to the 3rd vaccination between the invervention and control groups. Differences in knowledge of the HPV vaccination between intervention and control groups were tested using the χ^2 test, and differences in attitudes towards the HPV vaccination were examined using one-way analysis of variance. All tests were assessed at the 5% level of significance.

Results

All groups were comparable in age and social deprivation (Table 7.2). Data met the linearity of the logit and multicollinnearity assumptions required for the logistic regression analyses.

Table 7.2. Demongraphic characeristics of study participants (mean [sd])

Characteristic	First-time invitees		Previous non-attenders	
	Intervention	Control	Intervention	Control
Age	17·9 (0·76)	18·0 (0·69)	17·8 (0·81)	18·0 (0·74)
Social deprivation (IMD)	46·3 (13·12)	45·3 (13·0)	35·3(21·9)	36·2 (22·2)

Uptake of the 1st HPV Vaccination

Table 7.3. Proportion (% [n]) of individuals in each sample and within each group receiving the vaccinations

	First-time invitees		Previous non-attenders	
	Intervention (n=250)	Control (n=250)	Intervention (n=250)	Control (n=250)
1st Vac	28.4 (n=71)	19.6 (n=49)	23.6 (n=59)	10.4 (n=26)
2nd Vac	24.4 (n=61)	16.0 (n=40)	19.6 (n=49)	6.4 (n=16)
3rd Vac	22.4 (n=56)	12.0(n=30)	12.4 (n=31)	3.0 (n=8)

Financial incentives significantly increased initial uptake of the HPV-vaccination programme by approximately 10% (Table 7.3) in both first-time invitees, *OR* 1.63, *CI 95%* 1.075-2.472 (Table 7.4) and previous non-attenders, *OR* 1.63, *CI 95%* 1.075-2.472 (Table 7.4). The effect size did not vary between the two samples (non-significant interaction between Group [Intervention vs. Control] and Previous invitation), *OR* 0.611, *CI 95%* 0.319-1.172, $p > 0.05$.

Table 7.4. OR and CIs of Group and IMD for First-time invitees and Previous non-attenders for the 1st and 3rd vaccinations

		First-time invitees				Previous non-attenders			
			95% CI for OR				95% CI for OR		
		B(SE)	OR	Lower	Upper	B(SE)	OR	Lower	Upper
1st Vac	Group	0.489 (0.212)	1.630*	1.075	2.472	0.976 (0.255)	2.654*	1.609	4.378
	IMD	-0.002 (0.008)	0998	0.983	1.014	-0.004 (0.006)	0.996	0.985	1.007
3rd Vac	Group	0.766 (0.248)	2.152*	1.324	3.496	1.455 (0.409)	4.283*	1.920	9.551
	IMD	-0.013 (0.014)	0.987	0.970	1.004	-0.020 (0.008)	0.980*	0.964	0.996

*p<0.05

Uptake of the 3rd HPV Vaccination

The combination of financial incentives and text messages significantly increased completion of the HPV-vaccination programme by about 10% (Table 7.3) in both first-time invitees, *OR* 2.152, *CI 95%* 1.324-3.496 (Table 7.4) and previous non-attenders, *OR* 4.283, *CI 95%* 1.920-9.551 (Table 7.4). The size of effect was similar in the two samples (non-significant interaction between Group and Previous invitation), *OR* 0.494, *CI 95%* 0.194-1.257, $p > 0.05$.

Reduction in Uptake from 1st to 3rd Vaccination

Attrition between trial arms was similar: first-time invitees: intervention group = 6% vs. control group = 7.6%, χ^2 (1, n = 500) = 0.50, $p > 0.05$; previous non-attenders: intervention group = 11.2% vs. control group = 7.4%, $\chi^2(1, n = 500) = 2.39$, $p > 0.05$.

Social Deprivation

The effect of the intervention on uptake of the 1st and 3rd vaccinations was not modified by social deprivation in either of the two samples (1st vaccination: first-time invitees: *OR* 0.985, *CI 95%* 0.954-1.017; previous non-attenders: *OR* 0.998, *CI 95%* 0.76-1.021; 3rd vaccination: first-time invitees: *OR* 1.002, *CI 95%* 0.967-1.038; previous non-attenders: *OR* 1.007, *CI 95%* 0.966-1.049).

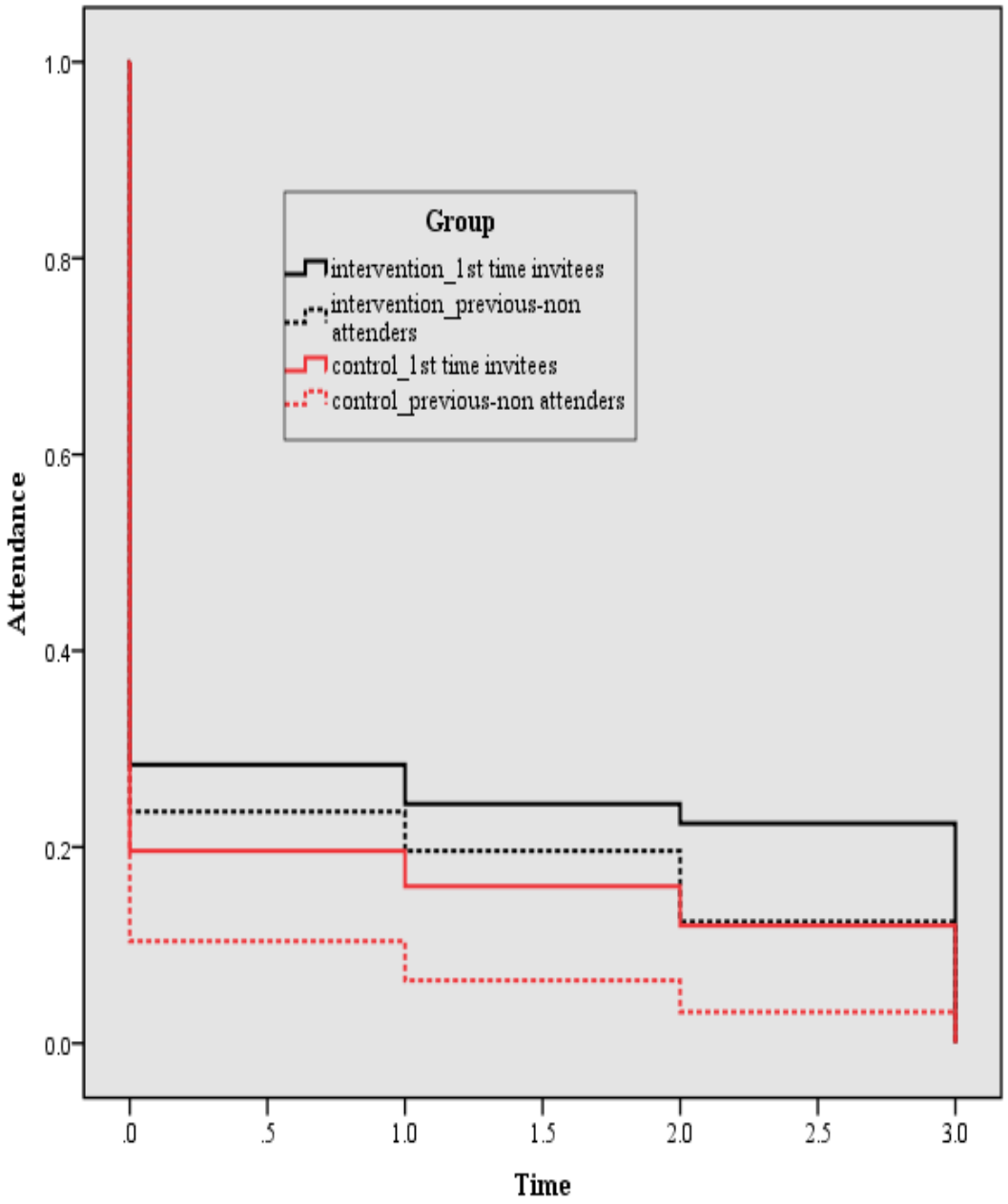
Social deprivation was unrelated to uptake of the 1st and 3rd HPV vaccinations amongst first-time invitees. For previous non-attenders, higher levels of social deprivation were associated with a reduced chance of uptake for the 3rd vaccination, *OR* 0.980, *CI 95%* 0.964-0.996, but not the 1st vaccination (Table 7.4).

Quality of Decisions

The quality of decisions to undergo the HPV vaccination was similar in the two trial arms: attitudes were similarly positive (first-time invitees: intervention group: 5.8 [sd=1.1], control group: 5.5 [sd=1.2]; previous non-attenders: intervention group: 5.7 [sd=1.2], control group 6.1 [sd=0.7], $F(3, 188) = 1.203$, $p > 0.05$.) and knowledge similarly high (first-time invitees: intervention group: 81.5% correct answers, control group: 84.5% correct answers; previous non-attenders: intervention group: 88.2% correct answers, control group: 87.5% correct answers), $\chi^2=(9, n = 193) = 9.017$, $p > 0.05$.

Responses to a question about possible reasons for getting vaccinated also revealed no differences between groups.

Figure 7.2. Drop-off in uptake of HPV vaccinations over time for each of the trial groups



Discussion

Consistent with the hypotheses, the offer of financial incentives increased the proportion of girls undergoing an initial HPV vaccination, while the combination of financial incentives and reminder text messages increased the proportion of girls completing the course of three HPV vaccinations. Contrary to predictions, these effects did not vary with level of social deprivation. Also contrary to predictions, the quality of girls' decisions to undergo the vaccinations was unaffected by the offer of financial incentives.

Meaning of the Results

Findings from the current study are consistent with previous research demonstrating the effectiveness of financial incentives in promoting immunisations (Achat et al., 1999; Briss et al., 2000; Seal et al., 2003). Incentives may have operated by increasing the anticipated benefits of attending vaccination appointments sufficiently to overcome any perceived barriers. One of the barriers most strongly predicting uptake of the HPV vaccination is cost (Conroy, Rosenthal, Zimet et al., 2009). Although in the UK the HPV vaccinations are free as part of normal care, getting vaccinated entails expenses, such as transport costs for attending clinics. Incentives may have operated by removing such financial barriers. Indeed, it has been shown that patients often use their rewards to cover expenses related to engaging in the target health behaviour (Post, Cruz & Harman, 2006). Although girls in the current study could not use their incentives to directly pay for their transportation costs, as these were offered in the form of vouchers, anecdotal evidence from a similar incentive scheme run in the same area as the present one, in which pregnant smokers were offered vouchers for quitting smoking (Mantzari, Vogt & Marteau, 2012a), suggests that participants often engage in mental accounting, according to which transportation costs are deducted from the value of the vouchers in order to determine net gains.

The incentives increased uptake of the vaccination by 10%, a surplus which the intervention maintained throughout completion of the programme, without reducing attrition between the 1st and 3rd vaccination. This finding could be taken as an indication of the superior effectiveness of the initial incentive, which may have been sufficient in maintaining the higher uptake rates without the subsequent incentives. It is not possible, however, to infer exactly how removal of the additional incentives would

have affected the results. The relative effectiveness of the incentives for each HPV vaccination should be examined in future research.

One potential advantage of financial incentives is that they may be more effective in motivating behaviour change in the most socially deprived (Sutherland et al., 2008). Contrary to such predictions, however, social deprivation did not modify the effect of incentives in the present study. Perhaps the role of social deprivation depends on the type of behaviour being targeted, and might therefore be limited in modifying the impact of incentives on uptake of the HPV vaccinations. It is also possible however, that this finding is related to the measure of social deprivation used in this study. Although IMD scores have been previously used to assess participants' level of deprivation (Marteau, Mann, Prevost et al., 2010), current findings may have resulted from the use of a proxy rather than a direct measure of social deprivation. Alternatively, it is possible that the range of social deprivation in the current study was too limited to allow for an effect to be detected. Future studies should aim to include participants to reflect a wider range of socioeconomic statuses.

Although the intervention in the present study was effective in promoting the HPV vaccination, the highest uptake rates observed were 28.4% for the 1st vaccination and 22.4% for the 3rd (by first-time invitees in the intervention group). These figures are well below the 80% uptake target set by the NHS. They are also considerably lower than the attendance rates for the catch-up programme in the Birmingham East & North (BEN) Primary Care Trust, where this trial was run (72.2% for the 1st vaccination; and 34·2% for the 3rd) as reported by the UK Department of Health (DH) (Sheridan et al., 2010). The reasons underlying these differences in rates of uptake are unknown. A number of explanations are possible: First, they may reflect cohort differences. For example, the DH report refers to the attendance rates of 17-18 year-olds, while participants in the present study were aged 16-18 years (additional analyses revealed no effect of age on uptake). Second, they may reflect differences in the methods of patient recruitment and delivery of the HPV-vaccination programmes. For example, delivery of HPV vaccinations through General Practitioners is less effective compared to delivery through schools (Sheridan et al., 2010). Third, they may reflect issues with the reliability of the data reported in the DH report or the Primary Care Trust's records. Anecdotal reports suggest that latter's records were not up to date, with girls who had

already received the HPV vaccination through schools being invited for the present scheme; similar errors might have occurred when feeding figures into the DH report.

Strengths

The main strength of this study is its novelty. It is the first study to assess the effectiveness of financial incentives for increasing uptake of the HPV vaccinations. It is also the first study to our knowledge that assessed deprivation-level as a moderator of a financial incentive scheme. The incentive scheme used was designed to maximise retention: unlike other studies that have offered fixed-value rewards for each vaccination (Seal et al., 2003), larger incentives (£20) were offered at the beginning and end of the programme, to motivate participants to initiate and complete the vaccinations.

Limitations

Results from this study do not allow inferences to be made regarding the effectiveness of financial incentives alone for completing the programme. Girls in the intervention groups received reminder text-messages prior to their 2nd and 3rd vaccination appointments. Due to an error made by the administration team, these reminder messages were not delivered to girls in the control groups. Vaccine recall and reminder systems are known to increase vaccination rates (Jacobson Vann & Szilagyi, 2009). It is possible therefore, that the higher uptake rates of the 3rd vaccination by the intervention groups is attributable to the reminder text-messages, with incentives having no additional effect. This seems unlikely given that incentives work best in combination with reminder systems and standing orders (Sutherland et al., 2008). Future research should examine the contribution of these interventions separately.

Furthermore, although findings appear to indicate that financial incentives do not compromise the quality of decisions to engage in an incentivised behaviour, with incentivised and non-incentivised girls' attitudes towards the vaccination being similarly positive and their knowledge of its consequences similarly high, some limitations associated with the measurement of informed choice in this study reduce the certainty of the conclusions that can be drawn. First, as mentioned previously, we used a simplified version of a measure of informed choice, originally developed and validated for use in the context of screening. The resulting measure may not have been sensitive enough to adequately assess informed choice in relation to HPV vaccination uptake.

Further research is needed to validate the measure for use in this specific context. Second, the measure relied on assessment of attitudes as a proxy of values, which according to the operational definition of informed choice need to be congruent with choices (Marteau et al., 2001). Although attitudes have been argued to reflect values (Marteau et al., 2001; Rokeach, 1968), the extent to which their measurement captures core values as traditionally conceptualised and measured (e.g. Rokeach, 1973; Schwartz, 1992) is unknown (Marteau, 2009). Furthermore, the measurement of attitudes alone provides little understanding of the potentially conflicting values individuals may hold when considering health-related decisions and how these affect their ability to make informed choices (Marteau, 2009). Further research is needed that will lead to the development of measures that better capture the values that underlie human health-related decisions (Marteau, 2009), which will in turn lead to more valid assessments of decision quality. Third, girls' knowledge of the vaccination's side-effects was not assessed in this study. Consequently, no inferences can be made about whether the offer of a financial reward results in the risks associated with the incentivised behaviour being overlooked (Marteau et al., 2009). Future research should assess the impact of incentives on the processing of risk -information associated with an incentivised health-behaviour. Another limitation is related to the timing of assessment. Girls were requested to complete the measure of informed choice once they had decided to get vaccinated. It is therefore possible that their attitudes towards the vaccination might have been influenced by their decision to receive it, rather than being a predictor of that decision. Furthermore, assessing decision quality after the offer of financial incentives does not allow inferences to be made regarding the mechanisms by which incentives might have influenced the decision-making process. For example, it remains uncertain whether incentives facilitated girls with positive attitudes towards the vaccination to act in line with their values or whether the incentives changed the girls' attitudes to make them more positive. Furthermore, by not having measures of attitudes of non-attenders the insights afforded by such a comparison with attenders were not possible. Future research should aim to assess individuals' knowledge and values related to an incentivised behaviour before incentives are offered. Including subsequent behaviour into the assessment, as proposed by Marteau et al (2001), will allow for a more valid assessment of informed choice and will help elucidate the mechanisms by which incentives influence health-related decisions. Finally, our findings do not allow firm conclusions to be drawn regarding the possibility of incentives to negatively influence autonomy and people's ability to voluntarily make decisions, and thus coerce

them, as the measure of informed choice did not directly tap into these concepts. Further research should aim to complement the assessment of informed choice with measures that allow for a more direct and precise assessment of whether incentives are coercive and undermine autonomous choices such as the Decisional Conflict Scale (O'Connor, 1995).

Implications

While the incentive scheme increased uptake of HPV vaccinations, it is unknown whether such effects can be achieved in more cost-effective and acceptable ways. Other HPV-vaccination programmes, such as those rolled out in schools (Sheridan et al., 2010), have achieved higher uptake rates than those achieved in this trial, without the expense of vouchers. Before the use of incentives is considered for wider implementation, research is needed to determine the optimal incentive value and delivery schedule for achieving maximum vaccination rates, supplemented with a formal cost-effectiveness analysis. Such cost-effectiveness analyses will need to take into account the extent to which the use of incentives might result in unintended consequences. These include the potentially adverse effect of incentives on intrinsic motivation (Deci et al., 1999), which might reduce the likelihood of individuals engaging in future health-related behaviours without the offer of rewards and the possibility for the offer of incentives to result in people refusing to adopt the incentivised behaviour due to arousal of suspicion (Frey & Jegen, 2001; Frey & Oberholzer-Gee, 1997).

Even if cost-effective, the use of incentives for increasing HPV vaccinations will depend on their acceptability to policy makers, health professionals and the public. The use of financial incentives for health promotion attracts negative views (Promberger et al., 2011) which, coupled with the controversy surrounding the HPV vaccine for condoning early sexual activity (Waller, Marlow & Wardle, 2006) may render the use of financial incentives for increasing HPV vaccinations unacceptable, as evidenced from the media coverage of the present scheme. For example, The Daily Mail online wrote: “HMV voucher bribe for teenage girls to have cervical jabs: Fury at ‘promiscuity

scheme' as NHS faces cuts" (Martin, 2010), while wideshut.co.uk reported: "Girls Bribed To Take Dangerous and Pointless HPV Vaccine" (Balderson, 2010)[4].

Conclusion

The combination of financial incentives and reminder text messages increased uptake and completion of the HPV vaccinations. Even with this intervention, however, the vaccination rates were considerably lower than the national target of 80%. This finding, in addition to the cost-effectiveness and acceptability issues surrounding the use of financial incentives in increasing uptake of HPV vaccinations, necessitate consideration of other ways of achieving effective vaccination coverage targets.

The next chapter

The findings presented in this chapter do not support the concerns regarding the potentially adverse impact of financial incentives on the quality of decisions to engage in incentivised behaviours. Conclusions, however, were based on assessment of participants' ability to make informed choices, which did not include knowledge of the adverse side-effects associated with the incentivised behaviour. The next chapter presents the findings from Study 5, a web-based experiment investigating the impact of financial incentives on the processing of risk-relevant information in the context of offering financial incentives to engage in a behaviour with potential adverse side-effects.

[4] These media reports were published in November 2010, after completion of the programme, which ended in September 2010, limiting the possibility that they may have confounded the results of the study.

Chapter 8

Does incentivising pill-taking undermine risk-information processing? Evidence from a web-based experiment

Abstract

Background: The use of financial incentives for changing health-related behaviours raises concerns regarding their potential to undermine the processing of risks associated with incentivised behaviours, thus adversely affecting the quality of people's decisions to engage in them. Uncertainty remains about the validity of such concerns. This web-based experiment assesses the impact of financial incentives on i) willingness to take a pill with side-effects; ii) the time spent viewing risk-information and iii) risk-information processing, as assessed by perceived-risk of taking the pill and knowledge of its side-effects. It further assesses whether any effects are moderated by cognitive-load.

Method: Two-hundred and seventy-five (n=275) university staff and students were recruited online under the pretext of being screened for a fictitious drug-trial. Participants were randomised to the offer of different compensation levels (no incentive, £25 or £1000) for taking a fictitious pill and the presence or absence of a cognitive-load task.

Results: Willingness to take the pill increased with the offer of £1000 (84% vs. 67%; OR 3.66, CI 95% 1.27-10.6), but not with the offer of £25 (79% vs. 67%; OR 1.68, CI 95% 0.71-4.01). Risk-information processing was unaffected by the offer of incentives. The time spent viewing the risk-information was affected by the offer of incentives, an effect moderated by cognitive-load: Without load, time increased with the value of incentives (£1000: M=304.4sec vs. £0: M=37.8sec, $p<0.01$; £25: M=66.6sec vs. £0: M=37.8sec, p=.00). Under load, time decreased with the offer of incentives (£1000: M=48.9sec vs. £0: M=132.7sec, $p<0.01$; £25: M=60.9sec vs. £0: M=132.7sec, $p<0.01$), but did not differ between the two incentivised groups ($p>0.05$).

Conclusion: This study, which empirically tested the adverse effects of financial incentives on risk-information processing, finds no evidence to suggest that incentives undermine risk-information processing. On the contrary, findings indicate that incentives signal risk, an effect, however, which disappears under cognitive-load, highlighting the need to maximise cognitive capacity when presenting information about an incentivised health-related behaviour.

Mantzari, E., Vogt, F., & Marteau, T.M. (under review). Does incentivising pill-taking 'crowd-out' risk-information processing? Evidence from a web-based experiment. *Social Science and Medicine.*

Background

Financial incentives are increasingly being considered and used in health care policies in the UK and elsewhere, in an attempt to improve health-related behaviours (Le Grand, 2008; Marteau et al., 2009), but unlike most interventions designed to change health behaviours, their use raises particular concerns regarding their potentially adverse effects on the quality of people's decisions to engage in incentivised behaviours. This is particularly relevant to behaviours associated with adverse side-effects, such as taking certain medicines, receiving immunisation, and attending screening appointments. The specific concern is that the prospect of receiving a financial reward could result in the risks associated with an incentivised health behaviour being overlooked (Marteau et al., 2009). There are two possible ways this could occur: first, financial incentives might lead people to ignore or not process risk-information; second, people might process risk- information but perceive the risks to themselves as low.

Results from a recent randomised controlled trial did not find the offer of financial incentives to undermine the quality of people's decisions to engage in an incentivised health-related behaviour (Mantzari, Vogt & Marteau, in press). These conclusions were based on an assessment of people's ability to make informed choices, as measured by their attitudes towards the target behaviour and their knowledge of its health consequences. Knowledge of the related adverse side-effects was not assessed in this study. Consequently, findings do not allow inferences to be made about whether or not the offer of a financial reward results in the risks associated with the incentivised behaviour being overlooked (Marteau et al., 2009). We are unaware of any studies that have assessed the impact of financial incentives on the processing of risk-information associated with an incentivised health-related behaviour. Research within two conceptually analogous domains could help elucidate the uncertainty. The first involves the use of payments for live organ donations, which have been criticised for undermining donors' ability to calculate the related risks (e.g. Becker & Elias, 2007; Olbrisch et al., 2001). Partial support for this claim derives from studies investigating the economic and health consequences of selling kidneys in India (Goyal et al., 2002) and Pakistan (Naqvi et al., 2007). Findings show that the majority of vendors were very poor and sold their organs to pay off debts, but would not recommend others to do the same. This could be interpreted as an indication that sellers were unaware of the negative consequences associated with organ donation. However, no conclusions can be

drawn regarding whether they were inadequately informed of the likely outcomes or whether the prospect of money led them to ignore the risks or perceive them as low. Recent research shows that as the risk of renal failure increases, individuals' become less willing to donate kidneys, regardless of the level of payment offered, therefore suggesting that financial incentives do not blind people to the risks of living kidney donation (Halpern et al., 2010).

The second related research area involves the use of financial incentives for participation in research, including clinical trials. Payments increase individuals' willingness to participate in research (Bentley & Thacker, 2004; Singer et al., 1999; Slomka et al., 2007). They have, however, been criticised for being undue inducements (Dickert & Grady, 1999) that alter decision-making processes, such that the side-effects of participating are not fully considered (Dickert et al., 2002) and risks are overlooked (Grant & Sugarman, 2004; London, 2005), thus leading individuals to expose themselves unwittingly to the possibility of harm (McNeill, 1997). These concerns are largely theoretical with the evidence about how participation payments influence perceived risk and decision-making processes being scare. The few studies that have been conducted in the area suggest that compensation does not lead people to neglect research risks (Bentley & Thacker, 2004; Dunn et al., 2009; Halpern et al., 2004; Singer & Couper, 2008). Specifically, it has been found that people make rational trade-offs between risk and benefit. Although they are willing to accept more risk in return for more money, this does not blind them to risk or distort their judgments (Bentley & Thacker, 2004; Dunn et al., 2009; Halpern et al., 2004; Singer & Couper, 2008). On the contrary, participation payments could signal risk and increase vigilance and information seeking when the amount offered is high. In one study, participants were allocated to view information regarding either a trial that involved drawing blood or a trial that involved Transcranial Magnetic Stimulation (TMS) and were offered either $25, $100 or $1000 for participation. Findings showed that compared to the low-payment scenarios, the offer of a high payment (i.e. $1000) increased participants' willingness to participate, but also increased perceived risk and the time they spent viewing the risk- information (Cryder et al., 2010).

Although the above findings highlight some of the potential effects of financial incentives on the processing of risk-information, certain limitations associated with the design of the studies do not allow firm conclusions to be drawn. These include first, a

failure to incorporate conditions of no payment, which prevents an assessment of the absolute effect of financial incentives on risk-information processing; second a lack of measures of individuals' knowledge of risks. It has been suggested that when motivated by cash payments, individuals may have less interest in assessing or comprehending study details, reading consent forms or attempting to understand the research aims and related risks (Grady, 2005). Accordingly, an assessment of the impact of financial incentives on individuals' knowledge of risks is essential. A third limitation of existing studies stems from the reliance on hypothetical scenarios, of which participants were aware. Only one study (Cryder et al., 2010) led individuals to believe that they were responding to information of an actual trial, in which they could participate.

In addition to the above, no studies have assessed the moderating role of cognitive-load on the impact of financial incentives on risk-information processing. In real-life situations, the cognitive resources of some people invited to decide about engaging in incentivised behaviours are often overloaded with matters of daily living. Consistent with the assumptions of "dual-processing" models of decision-making (e.g. Strack & Deutsch, 2004), findings demonstrate that cognitive-load inhibits activation of the reflective system that generates behavioural decisions based on reasoning, judgment and knowledge about facts and values and increases activation of the impulsive system that elicits behaviour through associative links (Hinson, Jameson & Whitney, 2002; Shiv & Fedorikhin, 1999). Consequently, under cognitive-load people have less ability to process risks and rely on heuristics to make satisfactory decisions with minimal effort (Friese, Hofmann & Wänke, 2009; Hofmann, Gschwendner, Friese et al., 2008b; Whitney, Rinehart & Hinson, 2008).

In sum, given the scarcity of empirical studies in the area, in addition to the above shortcomings, further research is needed, particularly experiments, to illuminate the mechanisms by which financial incentives influence people's decision-making mechanisms, including the processing of risk-information.

The present study

The aim of this study is to assess the impact of financial incentives on the quality of decisions to consume medicine with potential side-effects. This specific context was chosen because financial incentives have been used to improve medication compliance (e.g. DeFulio, Everly, Leoutsakos et al., 2012; Hill & Ramachandran, 1992; Morisky,

Malotte, Ebin et al., 2001; Pilote, Tulsky, Zolopa et al., 1996; Sorensen, Haug, Delucchi et al., 2007; Volpp, Loewenstein, Troxel et al., 2008b), yet their impact on the processing of side effects associated with most medicines has thus far remained unstudied.

The study specifically evaluates the impact of low-value and high-value financial incentives on i) willingness to consume a pill with side-effects, ii) the time spent viewing the pill-related information, and iii) risk-information processing, as assessed by a) the level of perceived risk associated with consuming the pill and b) knowledge of its side-effects. The study further assesses the extent to which any effects are moderated by cognitive-load.

Hypotheses

1) The offer of financial incentives increases the proportion of individuals who are willing to take the pill.

2) The offer of a low-value financial incentive does not increase the time spent viewing the pill-related information.

3) The offer of a high-value financial incentive increases the time spent viewing the pill-related information.

4) The offer of a low-value incentive does not affect risk-information processing.

5) The offer of a high-value incentive affects risk-information processing.

6) All above effects are moderated by cognitive-load

Methods

Design and overview

The present study is a web-based experiment. Participants were recruited online under the pretext of being screened for a fictitious trial examining the impact of a new cognitive-enhancing pill on memory. Using a 3x2 factorial design, participants were randomised to view webpages including the offer of different levels of financial incentives for taking the fictitious pill (no incentive; £25; £1000) and the presence or absence of a task intended to induce cognitive load.

Participants

To be included in the study participants had to a) have registered their interest in research participation with the Behavioural Research Lab at the London School of Economics, or be members of staff or the student body of two schools (School of Law and School of Arts and Humanities) of King's College London ,and b) have clicked on the study link sent to them via circular email (details under Recruitment and Randomisation). No exclusion criteria were imposed. The final sample comprised two-hundred and seventy-five (n=275) staff, students and alumni of universities based in London, UK. Figure 8.1. illustrates the flow of participants through the study and Table 8.1 presents participants' demographic characteristics. Their mean age was 25.3 years, ranging from 18 to 56 years and 52% were female. The majority was White (59%), with 29% classified as Asian and 5% as Black. Most participants were students (75%), working towards a first or second degree, 17.5% were in full-time or part-time employment and 6% were unemployed or homemakers.

Figure 8.1. Flow of participants through study

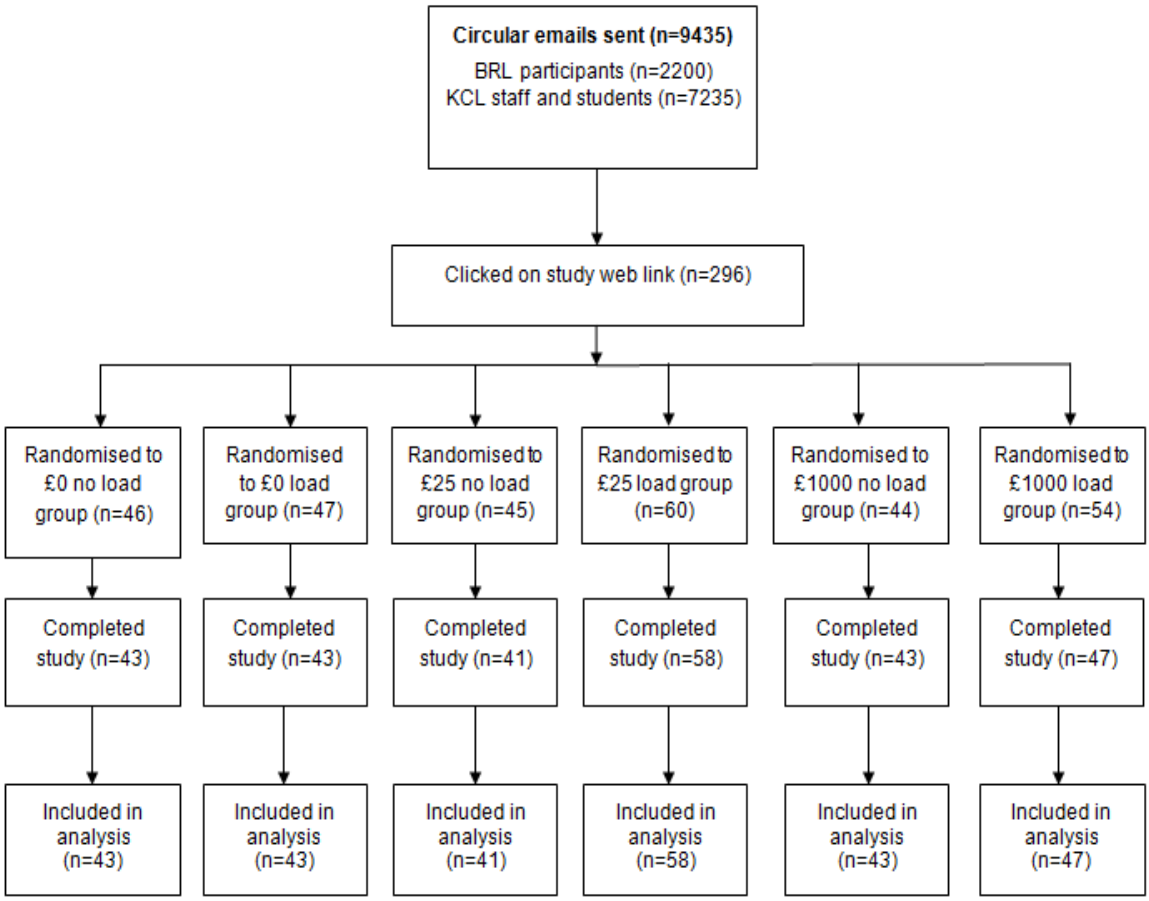


Table 8. 1. Demongraphic characteristics of study participants

	No incentives		**£25 (n=99)**		**£1000 (n=90)**		
Characteristic	**No load (n=43)**	**Load (n=43)**	**No load (n=41)**	**Load (n=58)**	**No load (n=43)**	**Load (n=47)**	**Total (n=275)**
Mean age yrs (sd)	24.4 (8.07)	23.9 (5.16)	25.7 (7.32)	23.9 (7.00)	26.7 (9.74)	25.2 (8.19)	25.0 (7.43)
Gender							
Male	44%	49%	41%	44%	51%	55%	48%
Female	56%	51%	59%	55%	49%	45%	52%
Ethnicity							
White	49%	63%	58%	52%	67%	66%	59%
Mixed	9%	2%	5%	7%	0%	4%	5%
Asian	37%	28%	27%	36%	21%	23%	29%
Black	2%	5%	10%	2%	5%	6%	5%
Occupation							
Student	74%	74%	68%	79%	79%	74%	75%
Employed full-time	14%	16%	19%	7%	16%	15%	15%
Employed part-time	0%	5%	2%	5%	2%	4%	3%
Unemployed	7%	2%	5%	3%	0%	0%	6%
Education							
A-levels	14%	12%	15%	19%	14%	17%	15%
Working towards degree	30%	28%	24%	28%	32%	21%	27%
Completed degree	21%	12%	17%	14%	9%	13%	14%
Working towards postgrad	21%	32%	24%	24%	20%	30%	25%
Completed postgrad	14%	14%	17%	12%	23%	17%	16%
Relationship							
Single	37%	60%	49%	64%	44%	59%	52%
In relationship	37%	26%	32%	21%	32%	28%	29%
Married	16%	2%	12%	7%	14%	9%	10%

Recruitment and Randomisation

Participants were recruited online through circular emails sent (*Appendix 8.1*) to the contacts of a large participant database held by the Behavioural Research Lab at the London School of Economics, and to the staff and students of two schools (School of Law and School of Arts and Humanities) of King's College London, UK. The emails informed participants of the existence of a fictitious trial assessing the impact of a new cognitive-enhancing pill on memory. Interested individuals were invited to complete the fictitious trial's eligibility screening process, by clicking on a link contained within the email, which led to the study website (*Appendix 8.2*). They were informed that they would receive a shopping voucher worth £10 for completing the screening process. Upon clicking the link, participants were randomised to view one of six webpages, differing in the level of incentives offered for consuming the fictitious pill (reimbursement of travel expenses; reimbursement of travel expenses plus £25; or reimbursement of travel expenses plus £1000) and the inclusion or exclusion of a task intended to induce cognitive load. This consisted of the presentation of a five-digit number, which participants had to remember and recall at a later stage during the study. The randomisation resulted in six study groups (Table 8.2) and was achieved by programming the webserver through JavaScript to generate a random number between 0 and 5. Each number had been pre-specified to correspond to one of the six groups. After generating the random number, the webserver automatically redirected the participant to the corresponding subpage. This procedure occurred within milliseconds and was not noticeable to participants.

Table 8.2. Study groups

	Absence of financial incentive	**Offer of £25 (low-value incentive)**	**Offer of £1000 (high-value incentive)**
Absence of cognitive load	N=43	N=41	N=43
Presence of cognitive load	N=43	N=58	N=47

Measures

Willingness to take the pill

Willingness to take the fictitious pill was assessed by requesting participants to specify whether they wished to participate in the fictitious trial. They chose one of four available options: a) *yes definitely*; b) *yes, probably, but I would like to discuss further with a member of the research team*; c) *no, probably not, but I would like to discuss further with a member of the research team;* d) *no, definitely not*. Because consumption of the pill was described as the central component of the fictitious trial, willingness to participate was considered equivalent to an affirmative disposition to taking the pill.

Time spent viewing risk-information

The time participants remained on the webpage presenting the pill-related information was recorded in milliseconds

Risk-information processing

Perceived Risk

Perceived risk associated with taking the fictitious pill was measured using a questionnaire consisting of:

i) two items assessing the *perceived likelihood* of experiencing any or all of the pill's side-effects, rated on a five-point scale ranging from 1: very unlikely to 5: very likely

ii) two items assessing the *perceived severity* of experiencing any or all of the pill's side-effects, rated on a five-point scale ranging from 1: very good to 5: very bad.

Average perceived likelihood and perceived severity scores were multiplied to obtain perceived risk scores.

Knowledge of side-effects

Knowledge of the pill's side effects was measured in three ways:

i) participants were requested to freely recall as many of the pill's side effects as they could and to indicate wherever possible, whether these were described in the pill-related information as "very common", "common" or "uncommon". One point was scored for every correctly listed side-effect. Another point was given if the side-effect was accompanied by a correct description of its frequency. Scores ranged from 0 to 24.

ii) participants were requested to choose from a list of possible side-effects the ones that were described in the related information as requiring medical attention. The possible options were: a) skin rash; b) fast heartbeat; c) speech problems; d) psychiatric reactions; and e) memory loss. The correct answers were (a) and (d) and participants were scored one point for correctly choosing each. Selection of all options was taken as an indication of participants' guessing and resulted in one point being deducted. Scores ranged from 0 to 2.

iii) participants were presented with six situations for which they were required to specify whether the pill should be taken with caution or should not be taken at all. The situations were: a) pregnant and/or breastfeeding women (should not be taken); b) people with high blood pressure (should not be taken); c) people with liver problems (should be taken with caution); d) people with irregular heartbeats (arrhythmias) (should not be taken); e) people with a history of mental health problems (should be taken with caution); f) people with a history of substance abuse (should be taken with caution); Participants were scored one point for each correct specification. Scores ranged from 0 to 6.

To obtain an aggregated measure of knowledge, scores from the three measures were added together. Aggregated scores ranged from 0 to 32. (Cronbach's alpha= 0.44)

Procedure

Upon entering the study website (*Appendix 8.2*), all individuals were presented with information about the fictitious trial, including its aim, which they were told was to assess the immediate impact of a new analeptic drug called Modagil, on non-sleep deprived individuals' performance on memory-related tasks. Participants were informed that the fictitious screening process would involve completion of a series of questionnaires and would result in receipt of a £10 Amazon voucher. They were further informed that completion of the trial would involve visiting a lab, taking a single dose (one pill) of the drug and completing a number of simple memory-related tasks.

Participants also read information regarding their compensation for taking part in the trial, which differed according to the group to which they had been allocated (travel expenses; travel expenses and £25; travel expenses and £1000). The subsequent webpage presented participants with information about the fictitious drug Modagil, including its approved and off-label uses, its side-effects, including information about those which require medical attention, and its counter-indications. Although Modagil is not a real drug, most of the information used in the study was modeled on the actual drug Modafinil. A fictitious name was chosen to prevent participants who could not recall the pill's side-effects from finding relevant information on the internet, in order to complete the measures of knowledge. It was confirmed that searching the internet for the term "Modagil" would only yield information regarding the trademarking registration for this brand by a pharmaceutical company. This was considered appropriate, as it would potentially reinforce participants' belief in the credibility of the fictitious drug. Informed consent was provided by all participants via the next webpage. Participants allocated to the groups exposed to the cognitive-load task subsequently viewed a webpage presenting them with five randomly selected digits, which they were instructed to memorise for later recollection. This "cognitive-load" manipulation has been used previously (Shiv and Fedorikhin, 1999; Hinson, Jameson, and Whitney, 2003; Whitney et al 2008). In the next webpage participants were requested to complete a questionnaire assessing demographic variables such as age, gender, level of education and occupation. Subsequently they were required to complete the measures of perceived risk and knowledge of the pill's side effects and were asked to specify their willingness to take part in the fictitious trial. To prevent participants from re-visiting the pill-related information in order to complete the measures of knowledge, the 'back' function of the website was disabled. Upon completion of all the measures, participants were debriefed and informed of the true aims of the study. The study was approved by the London School of Economics Research Ethics Committee, Reference Number 203/26.06.2012.

Statistical analysis

To increase power, responses regarding participants' willingness to take the pill were collapsed to create two outcomes: 'Yes' and 'No'. Time and knowledge scores were log-transformed to correct for their non-normal distribution. To assess the effects of financial incentives and cognitive-load on willingness to take the pill, logistic regression analysis was conducted. To assess the effects of financial incentives and the moderating role of cognitive-load on perceived risk and knowledge of the pill's side-effects,

univariate analyses of variance were conducted for each outcome variable separately. Due to the low Cronbach's alpha between items assessing knowledge, the effects of the independent variables on each component of the knowledge scale was also assessed. Where analyses revealed significant interactions between the two independent variables, these were explored using simple main effects analyses and pairwise comparisons using the Bonferroni correction. All tests were assessed at the 5% level of significance.

Power calculations

Given the £10 expense associated with each participant, the total sample size of 275 individuals was determined by the availability of resources. Post hoc analyses using GPower 3.1 revealed that the study had 80% power to detect a small effect (d=0.18) at the 5% significance level between groups on outcomes subjected to univariate analysis of variance, i.e. those relating to the time-spent viewing risk-related information, perceived risk, and knowledge. Based on the findings of Cryder et al.

(2010) relating to an average proportion of 17% of participants offered £25 being willing to participate in the trial (the study did not include a 'no incentive' control group), the present study also had 80% power to detect a minimum difference in willingness to take the pill of 18% between groups at the 5% statistical significance level using a two-tailed $\chi 2$ test.

Results

All groups were comparable in demographic characteristics (age, gender, education, occupation, ethnicity) (Table 8.1)

Willingness to take the pill

The offer of £1000 increased the proportion of participants' who were willing to take the pill (84% vs. 67% (Table 8.3); OR 3.66, CI 95% 1.27-10.6, p< 0.05). The offer of £25 did not significantly increase the proportion of individuals who were willing to take the pill (OR 1.68, CI 95% 0.71-4.01, p> 0.05) (Figure 8.1). Cognitive-load did not affect participants' willingness to take the pill (OR 1.24, CI 95% 0.50-3.05, p> 0.05) nor did it moderate the impact of financial incentives on willingness to take the pill (Interaction between offer of £1000 and cognitive-load: OR 0.46, CI 95% 0.11-1.95, p> 0.05; Interaction between offer of £25 and cognitive-load: OR 1.25, CI 95% 0.32-4.85, p> 0.05).

Figure 8.2: Proportion of individuals in each incentive group willing to take the pill

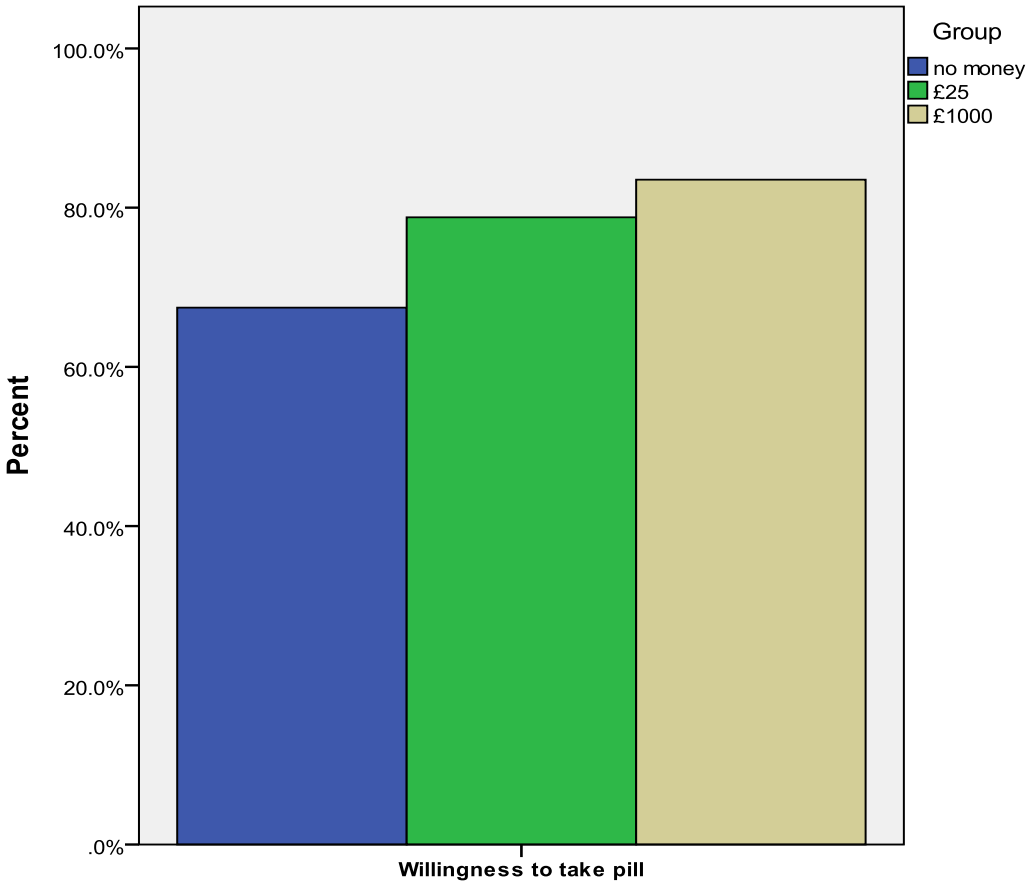


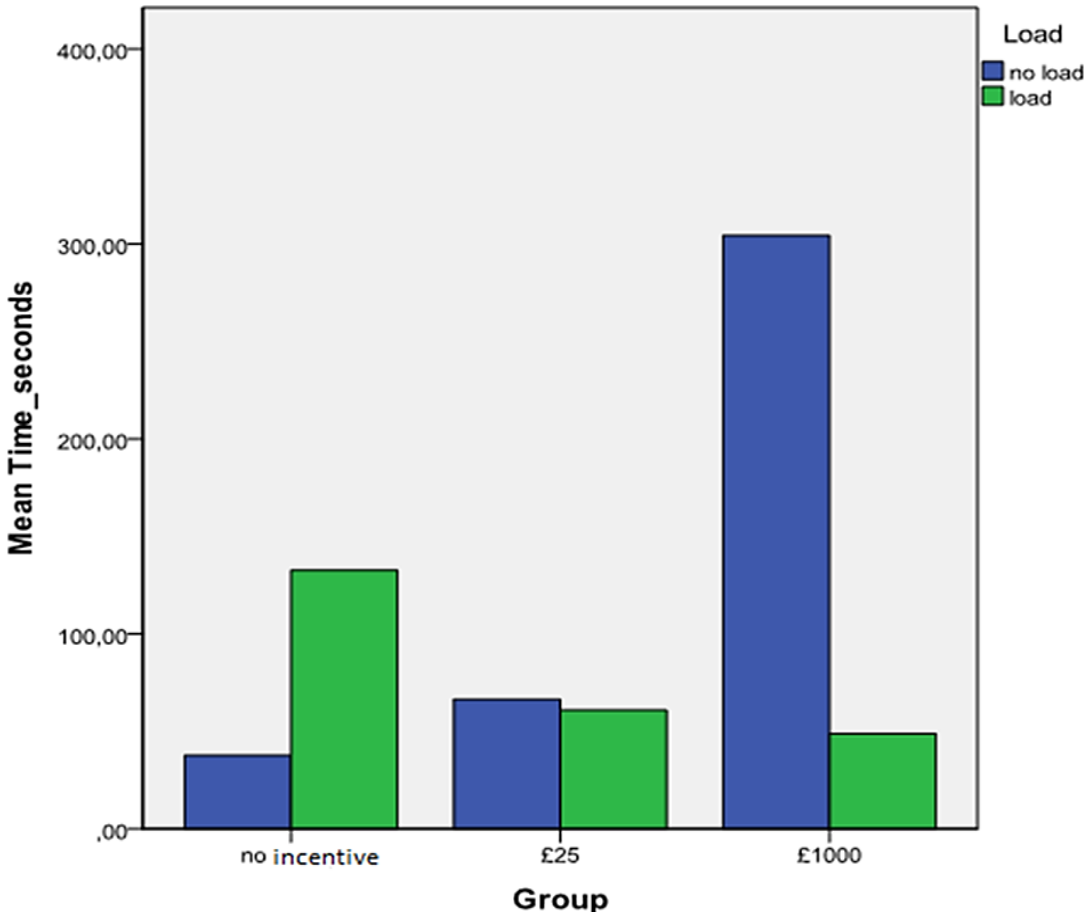
Table 8.3. Values of outcome variables for each group

	No incentives			**£25**			**£1000**		
	No load (n=43)	**Load (n=43)**	**Overall (n=86)**	**No load (n=41)**	**Load (n=58)**	**Overall (n=99)**	**No load (n=43)**	**Load (n=47)**	**Overall (n=90)**
% willingness to participante (n)	70% (30)	65% (28)	67% (58)	83% (34)	76% (44)	79% (78)	80% (35)	87% (41)	84% (76)
Time (sec) (sd)	37.77 (29.97)	132.7 (137,1)	85.24 (109,6)	66.59 (39.57)	60.93 (74.82)	63.27 (62.48)	304.4 (516.4)	48.94 (28.24)	172.5 (379.8)
Perceived risk (sd)	9.95 (4.15)	9.46 (4.92)	9.70 (4.53)	8.10 (3.26)	8.58 (3.77)	8.38 (3.56)	9.91 (4.45)	7.99 (3.43)	8.90 (4.04)
Knowledge (sd)	12.9 (5.90)	12.5 (5.90)	12.7 (5.87)	13,5 (6.37)	12.1 (5.30)	12.7 (5.79)	12.4 (7.04)	11.7 (4,.9)	12.0 (5.73)

Time spent viewing risk-information

The offer of financial incentives had a significant impact on the time spent viewing risk-information (F (2, 270) = 7.14, p<0.01) This effect was moderated by cognitive-load (F(2, 270)=35.4, p<0.01) (See Figure 8.2). The effect of incentive level was significant both in the absence of cognitive load (F (2, 270)= 33.1, p<0.01*)* and in its presence (F (2,270)=9.18, p<0.01). Under no load, participants offered £1000 for taking the pill spent longer time viewing the pill information (M=304.4 sec) compared both to those not offered incentives (M=37.8sec), p<0.01, and those offered £25 (M=66.6sec), p<0.01. Those offered £25 also spent more time viewing the information compared to those not offered incentives, p<0.01. Under load, those offered both £1000 (M=48.9sec) and £25 (M=60.9sec) spent less time viewing the information compared to those not offered incentives (M=132.7sec), p<0.01 (for both comparisons). There was no significant difference between the two incentivised groups, p>0.05. Among those not offered incentives, time increased in the presence of load (M=132.7sec) compared to its absence (M=37.5sec), p<0.01. The opposite pattern was observed for those offered £1000 (no load: M=304.4sec; load: 48.9) p<0.01. For those offered £25, there was no difference in time in the absence (M=66.6sec) and presence of cognitive-load (load: M=60.9sec) p>0.05.

Figure 8.3: Time (mean) spent viewing risk- information: impact of incentive level and cognitive load



Because the distribution of scores reflecting the time spent viewing the pill-related information was very positively skewed and leptokurtic, while casewise diagnostics identified four extreme outliers, additional analyses were conducted to assess the robustness of the aforementioned findings. Both median regression and robust regression revealed a similar pattern of results, confirming the significant impact of an interaction between the offer of incentives and cognitive load on the time spent viewing the pill-related information *(Appendix 8.3).*

Risk information processing

Perceived risk

The perceived risk associated with taking the pill was unaffected by the offer of financial incentives (F (2, 275) = 2.61, p>0.05). It was also unaffected by cognitive-load (F (1, 275) = 1.71, p>0.05). Cognitive-load did not moderate the impact of financial incentives on perceived risk (F (2, 275) =.2.08, p>0.05).

Knowledge of the side-effects

Knowledge of the pill's side-effects was unaffected by the offer of financial incentives. (F (2, 259) = .15, p>0.05). It was also unaffected by cognitive-load (F (1, 259) = .02, p>0.05). Cognitive-load did not moderate time impact of financial incentives on knowledge of the pill's side-effects (F (2,259) =.12, p>0.05). Each component of knowledge was also unaffected by the offer of financial incentives (Free recall: F (2, 252) = 1.36, p>0.05; Knowledge of side-effects requiring medical attention: F (2, 250) = 1.96, p>0.05; Knowledge of counterindications: F (2, 265) = 1.65, p>0.05) and cognitive load (Free recall: F (1, 252) = 1.59, p>0.05; Knowledge of side-effects requiring medical attention: (F (2, 250) = 0.77, p>0.05; Knowledge of counterindications: (F (2, 265) = 0.15, p>0.05), as well as the interaction between financial incentives and cognitive load (Free recall: F (2, 252) = 2.15, p>0.05; Knowledge of side-effects requiring medical attention: (F (2, 250) = 1.04, p>0.05; Knowledge of counterindications: (F (2, 265) = 0.92, p>0.05)

Discussion

The offer of £1000 increased the proportion of participants' who were willing to take a pill, but the offer of £25 did not. The offer of an incentive did not undermine the processing of risk-information: levels of perceived risk associated with taking the pill and knowledge of its side-effects did not differ between groups. Cognitive-load did not moderate the impact of financial incentives on willingness to take the pill or risk-information processing. The time spent-viewing the pill-related information was affected by the offer of financial incentives, an effect moderated by cognitive load: In the absence of load, time increased with the value of incentives, with those offered £1000 spending the longest viewing the information. Under load, the offer of financial incentives reduced viewing time, with both those offered £25 and £1000 spending less time viewing the information compared to those not offered incentives.

Interpretation

The offer of £1000 increased the proportion of participants who were willing to take the pill, both compared to the absence of incentives and the offer of £25. This is consistent with predictions and previous research showing that higher payments increase willingness to participate in clinical trials more compared to lower payments (Bentley & Thacker, 2004; Cryder et al., 2010; Halpern et al., 2004). Although the offer of £25 increased the proportion of individuals willing to take the pill by 12% (from -2% to 25%) compared to those not offered incentives, this difference was not found to be significant. This finding is contrary to predictions, as well as research showing that incentives as low as £3 ($5) can increase medication compliance (e.g. Bock, Sales, Rogers et al., 2001; Chernew, Shah, Wegh et al., 2008; Volpp et al., 2008b). One possible explanation for this result is that it is due to a lack of statistical power to detect such an effect. Indeed, post-hoc analyses revealed that the study was insufficiently powered to detect significant differences in willingness to take the pill between those offered £25 and those not offered incentives. An alternative explanation for the conflicting findings between the present and previous research is that they reflect cohort differences. The present study relied on healthy volunteers who would not have had direct health-benefits from taking the pill. Their willingness to do so therefore, is assumed to have been driven mostly by financial reasons. This is consistent with research showing that financial incentives are important motivators among healthy volunteers in their decision to participate in clinical trials (Tishler & Bartholomae,

2002). Outcomes regarding the impact of small-value incentives on medication compliance, however, are based on patient populations, who are motivated by health-benefits, as well as financial ones, for engaging in the incentivised behaviour. Patients' perceptions of potential health-benefits can alter the effects of monetary payments on decisions to engage in incentivised behaviours in ways that are different to healthy volunteers (Dickert & Grady, 1999; Dunn et al., 2009). Consequently, patients might require smaller incentives, compared to healthy individuals, to move them past the benefit-threshold needed for them to act. Another explanation for the conflicting findings is that they are the result of the use of different study procedures. In the present investigation participants were clearly informed about the possible side-effects of consuming the fictitious pill. It is unknown, however, whether studies assessing the impact of financial incentives on medication compliance have highlighted the related risks to the same degree. If not, differences in willingness to engage in the behaviours might have resulted from between-study differences in the salience of risks. A final explanation for the lack of effect in the present study is that perhaps it was driven by individuals' expectations of a larger offer of money. Consumption of the pill was presented in the context of a fictitious drug-trial. In the UK many trials pay between £1000-£2000 for participation (Jones, 2011). Possessing such knowledge might have led some of those offered £25 to decline participation.

Although the offer of £1000 increased participants' willingness to take the pill, it did not do so by leading them to overlook the related risks. Contrary to existing concerns (Dickert et al., 2002; Dickert & Grady, 1999; Grady, 2005; Grant & Sugarman, 2004; London, 2005; Marteau et al., 2009) financial incentives in this study did not undermine risk-information processing: levels of perceived risk associated with taking the pill and knowledge of its side-effects were similar between groups. This is consistent with previous research showing that in hypothetical situations, although people are willing to accept more risk in return for more money, this does not blind them to risk or distort their judgments (Bentley & Thacker, 2004; Dunn et al., 2009; Halpern et al., 2004; Halpern et al., 2010; Singer & Couper, 2008). On the contrary, large offers of compensation have been suggested to signal risk (Cryder et al., 2010; Frey & Oberholzer-Gee, 1997). Consistent with this assumption, a study by Cryder et al., (2010) showed that high payments for trial participation increased information-seeking, as well as perceived risk. Similarly, those offered large incentives in the present study spent the longest time viewing the risk-information. Most importantly, however, results

from the current study also show that even small incentives can signal risk, as indicated by an increase in the time spent viewing risk-information by those offered £25 compared to those not offered incentives. Contrary to the findings of Cryder et al., (2010), however, no effect was observed on perceived risk in the current study. There are two possible explanations for this conflicting result. First, it might reflect the use of different measures of perceived risk. In Cryder et al., (2010) participants made judgements about a medical procedure's riskiness in comparison to other risky activities. In the present study, however, individuals assessed their level of personal perceived risk associated with consuming the pill. Evidence suggests that although people may judge an activity as risky, they do not always feel that the risk applies to them personally (e.g. Lichtenstein, 1978). This suggests that the apparently conflicting result between the current study and Cryder et al., (2010) could reflect the measurement of different aspects of perceived risk. Second, differences in findings between the two studies might represent different levels of riskiness associated with the procedures in which participants were requested to engage. Cryder et al., (2010) requested individuals to evaluate a study involving Transcranial Magnetic Stimulation (TMS), an intrusive procedure with uncertain, possibly serious risks (e.g. seizures). In the present study, the possible side-effects associated with the fictitious pill were arguably less severe (e.g. headache, dizziness, weakness, nosebleeds, speech problems, memory loss, skin reactions). If different results are associated with the different levels of riskiness of procedures involved in each study, this would imply that individuals do not simply equate large incentives with riskiness in an automatic way, but perceive them as an indication of the need to pay more attention to risk-information and search for potential risks. Whether or not this increased vigilance leads to increased levels of perceived risk may depend on the actual riskiness of the related procedures. This is partially supported by the fact that in the present study, the level of perceived risk of those offered £1000 decreased as their knowledge of the side-effects increased ($r(84) = -0.22$, $p < 0.05$). Future research should assess how the impact of large incentives on levels of perceived risk is moderated by the riskiness of the incentivised behaviour or procedure.

The offer of large incentives resulted in the greatest increase in the time spent viewing the risk-information, but contrary to predictions, this was not accompanied by an increase in knowledge of the pill's side effects. This raises the question of what people were doing during the additional time they viewed the pill-information. There are two possible answers. First, based on the assumption that large payments signal more risk, it

is possible that those in the high-incentive group used the additional time to examine the information more carefully for anything that could be alarming, but did not pay additional attention to information they did not perceive as risky. According to this possibility, large incentives would increase knowledge of severe side-effects, rather than of all side-effects in general. As the variation of side-effect severity in the present study was not particularly wide, this assumption cannot be tested. Future research should assess the moderating role of side-effect severity on the impact of financial incentives on related knowledge. Alternatively, it is possible that the lack of differences in knowledge was the result of a ceiling effect. Perhaps the chosen side-effects were particularly easy to remember. Indeed some, such as headache and dizziness, are commonly associated with many medications. Consistent with this assumption, knowledge levels in this study were fairly high in all groups, regardless of the difficulty of the free-recall measure used. Consequently, perhaps the additional time participants spent on the pill-information failed to increase knowledge because they had reached the limits of their working memory capacity.

Consistent with the aforementioned notion that incentives are not equated with risk in an automatic way is the finding that under cognitive-load the signalling effect of incentives –implied by increased time spent viewing risk-information– disappeared. In fact, in the presence of cognitive-load, those offered £1000 spent the least amount of time viewing the pill-related information. It appears that the offer of incentives, especially large ones, under conditions of load can undermine risk-information seeking, perhaps due to the activation of more automatic processes. Cognitive load inhibits activation of the reflective system –which generates behavioural decisions based reasoning, judgment and knowledge about facts and values– and increases activation of the impulsive system –which elicits behaviour through associative links that the person has acquired over many experiences– (Hinson et al., 2002; Shiv & Fedorikhin, 1999). Consequently, it has been argued that under cognitive load people have less ability to process risks and rely on heuristics to make satisfactory decisions with minimal effort (Friese et al., 2009; Hofmann et al., 2008b; Whitney et al., 2008). In the present study, however, the decreased time spent viewing risk-information under conditions of cognitive load by those offered incentives did not undermine risk-information processing. Furthermore, cognitive load alone was not sufficient to achieve a shift towards activation of the impulsive system, thus highlighting the crucial role of the combination of load and information regarding the offer of incentives. The presence of

load increased the time spent viewing risk-information by those not offered financial incentives. As information seeking could be considered a deliberative process, this finding could be taken as an indication of the increased activation of the reflective system. Because of the extra burden on their working memory, it appears that individuals in this group needed longer time to process the risk-related information. This is consistent with findings showing that individuals with less working memory capacity require longer time for syntactic processing, which is involved in reading. (Just & Carpenter, 1992; King & Just, 1991).

Strengths

The main strength of this research is its novelty. It is the first study to assess the impact of financial incentives on knowledge of an incentivised behaviour's side-effects. It is also the first study to assess the moderating role of cognitive load on the impact of financial incentives on risk-information processing. Furthermore, it the first study to incorporate conditions of no payment, thus allowing for an assessment of the absolute effect of financial incentives on risk-information processing. Finally, the study overcame the compromised generalisabilty of previous research findings, which resulted from a reliance on hypothetical scenarios which participants were aware of. Although participants in the current research were presented with information about a fictitious trial, measures were taken to establish its credibility, thus maximising the chance that responses reflected judgements that would have been made if financial incentives were actually offered.

Limitations

There are some limitations associated with the present study. The first relates to the possible discrepancy between willingness to take the pill and actual behaviour. Although the majority of participants were willing to take the pill, it is not known how many would actually do so if requested. Future research should assess the impact of financial incentives on information processing and its relationship to actual rather than intended behaviour. Second, although measures were taken to ensure that the trial appeared credible, it is possible that some participants may have realised its fictitious nature, which could have influenced their responses. As perceived credibility of the trial was not measured, the extent to which this occurred cannot be assessed. The third limitation relates to the generalisabilty of the results. We do not know if similar findings will be obtained with a patient population offered payments to take a medicine. Future

research should replicate this study with patient populations. The moderating role of cognitive load on the time spent viewing the risk-related information also requires replication under real-life conditions. Finally, although findings allow for inferences to be made regarding the impact of financial incentives on risk-information processing, no conclusions can be made regarding whether decisions to take the pill were fully informed. According to the operational definition by Marteau et al., (2001) an informed choice is one that is based on knowledge of the salient information and is in line with the decision-maker's attitudes. Attitudes towards the fictitious pill, however, were not assessed in the present study, which would have provided a more complete picture of the impact of financial incentives on the quality of decisions to engage in incentivised behaviours.

Implications

The findings from the present study add to the evidence which challenges existing concerns regarding the adverse impact of financial incentives on the processing of risk-information associated with incentivised behaviours. In fact, results suggest that incentives, especially large ones, signal the need for increased attention towards risk-information. Results further suggest that under conditions of cognitive-load this signalling effect disappears. As cognitive-load is affected by the design and format of information and instructions (Chandler & Sweller, 1991; Sweller, 1994; Sweller, Van Merrienboer & Paas, 1998), the findings highlight the importance of presenting information about incentivised health-related behaviours and their consequences in a way that maximises cognitive capacity, in order to preserve the signalling effect of incentives and encourage focused attention.

Conclusion

The findings from the present study challenge concerns regarding the adverse effects of financial incentives on risk-information processing and the quality of decisions to engage in incentivised behaviours. Low value incentives do not undermine risk-information processing or affect willingness to perform incentivised behaviours. Although large-value incentives increase willingness to engage in incentivised behaviours, their offer signals more risk. Offered when the cognitive capacity to process information is reduced, this signalling effect disappears, highlighting the need to maximise cognitive capacity when presenting information about an incentivised health-related behaviour.

The next chapter

The following chapter presents a discussion of the main findings of the studies included in this thesis and their related implications for practice, policy and future research.

Chapter 9

Discussion and conclusions

Abstract

The aim of the research presented in this thesis was to assess the behavioural and cognitive consequences of using financial incentives to change health-related behaviours. In addressing this aim, the thesis had the following objectives:

1. To estimate the effectiveness of financial incentives in changing health-related behaviours
    i. regardless of whether they are still offered
    ii. when they have been discontinued (sustained effectiveness)
2. To examine the factors that modify the impact of financial incentives on health-related behaviours
3. To explore the possible confounding variables that might inadvertently influence the impact of financial incentives on health-related behaviours
4. To assess the impact of financial incentives on the quality of people's decisions to engage in incentivised behaviours

This final chapter is divided into two parts. The first part presents a summary of the studies incorporated in the thesis, including their findings, strengths, limitations and implications. The second part is organised around the four research objectives and presents conclusions regarding the evidence in relation to each, which is discussed in the context of the related implications for future research, practice and policy. The chapter ends with a consideration of the questions that still need to be answered and of the strengths and limitations of the thesis, followed by an overall conclusion.

Summary of studies

<u>Study 1:</u> Personal financial incentives for changing repeated health-related behaviours: a systematic review and meta-analysis

Main findings

- Financial incentives changed repeated health-related behaviours with effects lasting up to 18 months from intervention start but weakening over time.
- Changes were sustained for up to three months after removal of the incentives.
- The impact of financial incentives on repeated health-behaviour appeared driven by studies assessing smoking cessation.
- Improvements to smoking cessation through the use of financial incentives lasted up to 18 months from intervention start and three months post-incentive removal.
- Improvements to indicators of healthier eating and/or physical activity (body weight, cholesterol levels and haemoglobin levels) lasted for up to 12 months from intervention start but disappeared after the removal of incentives.
- Financial incentives did not significantly improve physical activity-related behaviours but null findings may be due to a lack of statistical power.
- The target behaviour, incentive value and incentive type did not independently modify incentive effectiveness at any of the assessed time-points.
- An interaction between the target behaviour and incentive value modified effectiveness at six months from intervention start: lower value incentives for smoking cessation reduced attainment of the target behaviour.
- Recipients' deprivation level modified incentive impacts between six and 12 months from intervention start, with higher deprivation levels increasing attainment of the behaviour, but not at other assessed time-points.
- The findings provided some support in favour of incentive effects being overestimated by a lack of standardisation of study procedures between incentivised and control groups and the use of unreliable outcome measures.

Strengths

- This is the first review of which we are aware to provide an overall estimate of the impact of financial incentives across a range of repeated health-related behaviours.

- It the first review to focus explicitly on assessment of the sustained impact of financial incentives on repeated health-related behaviours, i.e. after removal of the incentives.
- It is one of the few reviews to systematically assess the role of potential effect modifiers, including the target behaviour, incentive value and type, and recipients' deprivation level.
- The review empirically demonstrated for the first time the role of recipients' deprivation level in the moderation of the impact of financial incentives on health-related behaviours, thus highlighting the potential of incentive schemes to reduce health inequalities.
- It is the first review of which we are aware to include an assessment of whether the effectiveness of financial incentives can be confounded by a lack of standardisation of study procedures and the use of unreliable measures.

Limitations

- Interpretations require caution as the review lacked statistical power with regards to certain assessments, including: i. the sustained impact of financial incentives on overall behaviour beyond 18 months from intervention start; ii. the impact of financial incentives on physical activity; and iii. the role of certain of the targeted effect modifiers.
- The role of many potentially important effect modifiers was not examined, such as whether the incentive scheme involved use of a deposit contract system, the duration of the incentive scheme, the immediacy of incentive delivery and the frequency of reinforcement.

Implications

- Financial incentives change repeated health-behaviours and may help reduce health inequalities. However, their role in reducing the burden of non-communicable diseases is potentially limited given the lack of evidence regarding the sustainability of effects beyond three months after incentive removal.
- Incentivises could be used to initiate behaviour change with their use complemented by behaviour maintenance and relapse prevention techniques which could be delivered after their removal. Effects may also be larger if incentives are delivered in context of environments that support healthier behaviour as the default.

Future research, however, should first establish the cost-effectiveness of financial incentives schemes aimed at changing repeated health-behaviours.

- Given the lack of sustainable effects, in addition to the potential cost-effectiveness and acceptability issues surrounding the use of financial incentives for changing health-related behaviours, future research and policies should perhaps investigate and consider the application of population level interventions to change environments, including the use of economic mechanisms, such as taxation or product pricing.

<u>Study 2:</u> Financial incentives for smoking cessation during pregnancy: is it from being paid or the extra aid?

Main findings

- Pregnant smokers who were incentivised for smoking cessation and those not receiving incentives reported similar reasons for wanting to stop smoking during pregnancy.
- Incentivised and non-incentivised women described dissimilar experiences of the NHS Stop-Smoking Services, which they perceived to have differentially influenced their quit attempts.
- Women who were incentivised reported using the services more than women who were not incentivised and described the motivating experience of being monitored and receiving feedback on their progress.
- Non-incentivised women reported problems receiving the appropriate Nicotine Replacement Therapy, which they described as having a detrimental effect on their quitting efforts.

Strengths

- This is the first investigation attempting to determine how financial incentive schemes for smoking cessation during pregnancy may have their effects.
- It is the first study to explore the experiences and perceptions of pregnant smokers who were incentivised for cessation and compare them with those of pregnant smokers not receiving incentives.

- The comparative design used in this study allowed for identification and exploration of the factors that could potentially confound the impact of financial incentives on smoking cessation during pregnancy.
- The study is one of the largest interview-based studies of pregnant smokers (focusing on the accounts of thirty-six women), who are an extremely difficult group to recruit and study.

Limitations

- The qualitative, exploratory nature of the study does not allow for causal relationships to be established between the variables identified as being important and smoking cessation.
- The financial incentive scheme described in the study was pending formal evaluation at the time this research was conducted, thus precluding conclusions regarding whether reported between-group differences were related to differential effectiveness.
- At the time the interviews were conducted few women in either group had stopped smoking, thereby precluding comparisons within and between groups between quitters and non-quitters.

Implications

- Findings from this study highlight the need to be cautious about attributing the effects of financial incentives schemes to incentives *per se*, given that such schemes are complex behavioural interventions that might operate through one or more of various pathways.
- Future studies evaluating the impact of financial incentives on health-related behaviours should attempt to eliminate the influence of potential confounding variables by standardising study procedures between incentivised and control groups.

<u>Study 3:</u> Financial incentives for increasing uptake of HPV vaccinations: a randomised controlled trial.

Main findings

- The offer of financial incentives increased initial uptake of an HPV vaccination programme.
- The combination of financial incentives and reminder text messages increased completion of an HPV vaccinations programme.
- The effects of financial incentives on uptake and completion of the HPV vaccination programme were not modified by recipients' level of deprivation.
- The quality of girls' decisions to undergo the vaccinations was unaffected by the offer of financial incentives: attitudes towards the vaccination were similarly positive and knowledge of its health consequences similarly high for incentivised and non-incentivised participants.

Strengths

- This is the first study to assess the effectiveness of financial incentives for increasing uptake of the HPV vaccination.
- It is the first trial of which we are aware that assessed the role of deprivation level in the potential moderation of the impact of financial incentives on health-related behaviours.
- The incentive scheme used was designed to maximise retention: unlike other studies that have offered fixed-value rewards for each vaccination, larger incentives (£20) were offered at the beginning and end of the programme, to motivate participants to initiate and complete the vaccinations.

Limitations

- Results from this study do not allow inferences to be made regarding the effectiveness of financial incentives alone for completing the programme. An error made by those administrating the scheme resulted in girls in the intervention groups receiving reminder text-messages prior to their 2nd and 3rd vaccination appointments, but not girls in the control groups.
- Conclusions regarding the impact of financial incentives on the quality of decisions are limited due to certain methodological shortcomings. First, the

measure of informed choice used in the study, which was developed for use in the context of screening, might not have been sensitive enough to assess decision quality in the context of HPV vaccination uptake. Second, girls' knowledge of the vaccination's side-effects was not assessed in this study. Consequently, no inferences can be made about whether the offer of a financial reward undermines risk-information processing. Third, assessing informed choice after girls had decided to get vaccinated raises the possibility that attitudes towards the vaccination were influenced by their decision to receive it. Finally, assessment of decision quality after the offer of financial incentives and only in those deciding to get vaccinated does not allow inferences to be made regarding the mechanisms by which incentives might influence decision-making processes.

Implications

- Although the intervention was effective in increasing completion of the HPV vaccination, uptake was well below the 80% uptake target set by the NHS, compromising the applicability of this intervention in this context.
- It is unknown whether the use of financial incentives for uptake of the HPV vaccination is cost-effective. Future research in this context should be supplemented by a formal cost-effectiveness analysis.
- The use of financial incentives for health promotion attracts negative views, as does the HPV vaccine, which is perceived as condoning early sexual activity. The use of financial incentives for increasing HPV vaccinations may therefore be too unacceptable.
- Low uptake rates coupled by cost-effectiveness and acceptability issues necessitate consideration of alternative ways of achieving the vaccination coverage target set by the NHS.

Study 4: Does incentivising pill-taking undermine risk-information processing? Evidence from a web-based experiment

Main findings

- Willingness to take a fictitious pill increased with the offer of £1000, but not with the offer of £25.
- Risk-information processing was unaffected by the offer of incentives: levels of

perceived risk associated with taking the pill and knowledge of its side-effects were similar between groups.

- The time spent viewing the risk-information was affected by the offer of incentives, an effect moderated by cognitive-load: Without load, time increased with the value of incentives. Under load, time decreased with the offer of incentives but did not differ between the two incentivised groups.

Strengths

- This is the first study to assess the impact of financial incentives on knowledge of an incentivised behaviour's side-effects.
- It is the first study to assess the moderating role of cognitive load on the impact of financial incentives on the processing of risk-information.
- It is the first study to incorporate conditions of no payment when assessing the impact of financial incentives on risk-information processing, thus allowing for an assessment of the absolute effect of financial incentives.
- Measures were taken to establish the fictitious trial's credibility and to maximise the chances that responses reflected judgements that would have been made if financial incentives were actually offered, thus overcoming the compromised generalisabilty of previous research findings, which resulted from a reliance on hypothetical scenarios of which participants were aware.

Limitations

- The study used a proxy measure of behaviour rather than actual behaviour when assessing willingness to take the pill. Future research should assess the impact of financial incentives on information processing and its relationship to actual rather than intended behaviour.
- Although measures were taken to ensure that the trial appeared credible, it is possible that some participants realised its fictitious nature, which could have influenced their responses.
- The generalisability of the findings might be compromised due to the use of an analogue design. The moderating role of cognitive load on the time spent viewing the risk-related information requires replication under real-life conditions.
- Attitudes – an essential component of the concept of informed choice (Marteau et al., 2001)-- towards the fictitious pill were not assessed in the study. Inclusion of

such an assessment would have allowed for a more complete picture of the impact of financial incentives on the quality of decisions to engage in incentivised behaviours to be drawn.

Implications

- The findings challenge concerns regarding the adverse effects of financial incentives on risk-information processing. On the contrary, they indicate that incentives signal risk, suggesting a cautionary impact.
- Given the signalling effect of incentives can disappear under cognitive load, the findings highlight the need to optimise cognitive capacity when presenting information about incentivised health-behaviours.
- Future research should attempt to replicate the findings from the present study with patient populations offered financial incentives for taking a medicine.

Addressing the research objectives

The effectiveness of financial incentives in changing health-related behaviours

The thesis focused on two different types of health-related behaviours: simple, one-off behaviours and complex, repeated behaviours. Within the literature, discussions regarding the effectiveness of incentives have distinguished between these two different behaviour types. Financial incentives have been found most effective in promoting simple, one-off health-related behaviours (Jochelson, 2007; Kane et al., 2004; Sutherland et al., 2008). Consistent with these findings, the research in Chapters 6 and 7 demonstrated that financial incentives can increase uptake of an HPV vaccination programme. Although the effectiveness of incentives in increasing uptake of recommended vaccinations has been previously shown (Achat, McIntyre& Burgess, 1999; Briss, et al, 2000; Seal, et al, 2003), their use in promoting the HPV vaccinations had hitherto remained unexamined. In order to accurately address the question of incentive effectiveness, however, we need to consider it in relation to the outcomes of interest, which are arguably different for different types of behaviours**.** When targeting simple, one-off behaviours, such as vaccination uptake, the goal is to achieve a behaviour for a limited number of occasions on which the intervention is offered. Consequently, the issue of sustainability of changes does not apply to these behaviours. The issue of transferability and whether, for example, the impact of incentivising uptake of one vaccination can affect uptake of other recommended vaccinations in the future

could be considered a form of change sustainability. Consideration of this, however, is beyond the scope of this thesis. Based on the aforementioned goal, the findings from Chapters 6 and 7 would support the conclusion that financial incentives are effective in changing health-related behaviours. However, assessment of the effectiveness of an intervention, such as the use of incentive schemes, should also include a consideration of its effect size and clinical significance in relation to the targets that have been set for specific health behaviours. With regards to uptake of the HPV vaccination, the NHS has set a vaccination coverage target of 80% of the target population (i.e. girls aged 12-18 years). Even with the intervention, uptake rates reported in Chapter 7 were much lower than this target, a finding which questions the use of incentives in this context.

When targeting complex, repeated health-related behaviours, the goal is two-fold: to initiate changes and sustain these after discontinuation of the intervention. Previous research suggests than incentives are effective in initiating changes to repeated health-related behaviours, but fail to lead to sustained changes (Jochelson, 2007; Kane et al., 2004). Consistent with this conclusion, Chapter 4 demonstrated that financial incentives can change complex, repeated health-related behaviours, but their effects are not sustained. Rather, they disappear a few months after incentive removal. Lack of sustained change is a problem shared by most interventions aimed at changing repeated health-behaviours (Ogden 2012). Although we cannot assess whether incentives are more or less effective than other interventions in this respect, findings suggest that if permanent change is the goal, incentives can't help attain it, demonstrating their limited role in reducing the global burden of non-communicable diseases.

In sum, financial incentives are effective in changing health-related behaviours. Such change, however, is not necessarily sufficient when assessing the use of such schemes, as effect sizes might not have clinical significance and changes are not sustained long after removal of the incentives.

Factors that modify the impact of financial incentives on health-related behaviours

The research in this thesis assessed the role of the following potential modifiers of the effects of financial incentives on health-related behaviours: the target behaviour, incentive value, incentive type (whether its attainment is certain or uncertain) and recipients' level of deprivation. Although the impact of some of these variables is

demonstrated in the thesis, findings do not allow for firm conclusions to be drawn regarding their exact effects.

The systematic review presented in Chapters 3 and 4 did not find responses to incentives to be modified by the target behaviour. Findings, however, suggested that the use of incentives might be more promising for smoking cessation, compared with other repeated health-behaviours assessed in the thesis. This could be the result of the increased research attention incentives for smoking cessation have received. As mentioned previously, the goal for interventions targeting these behaviours is to produce sustained behaviour change. As demonstrated in Chapter 4, incentive effects did not last more than three months beyond incentive removal for any of the targeted behaviours. Consequently, one could argue that incentives are equally effective (or equally ineffective) across repeated health-related behaviours in producing the desired goal.

One of the variables often discussed as influencing behavioural responses to incentives is incentive value (Catania, 1963; Jochelson, 2007; Kane et al., 2004; Lussier et al., 2006; Sutherland et al., 2008). Findings from Chapter 4 suggest a role of incentive value, but only in modifying the impact of financial incentives on smoking cessation. Given the methodological shortcomings associated with this research, to conclude that incentive value is not important for changing other health-behaviours would be premature. Further research should not only attempt to further assess the role of incentive value in modifying responses to incentives, but ideally to determine the optimal value that needs to be offered in order to effectively change different behaviours. Similarly, no conclusions can be drawn regarding the modifying role of the certainty of incentive attainment.

The role of recipients' deprivation level is varied within this thesis. The systematic review in Chapter 4 found effect sizes were greater for those classified as highly deprived, for one of the assessed timed-endpoints, thus highlighting the potential of incentive schemes in helping reduce health inequalities. The trial in Chapter 7, however, did not find deprivation level to be a significant effect modifier. There are two possible explanations for these different findings. First, the role of deprivation might depend on the type of behaviour being targeted. Although it might be significant in changing repeated health-related behaviours, it might not be important when targeting non-repeated health-behaviours, such as vaccination uptake. The modifying role of deprivation level on the impact of incentives on one-off behaviours should be

investigated in the context of evidence synthesis, in a similar manner to how it was assessed for repeated health-related behaviours in the systematic review presented in this thesis. Second, deprivation level might be important when targeting one-off behaviours but its effects could not be detected due to methodological shortcomings associated with the trial presented in Chapters 6 and 7. In any case, further research is clearly warranted to allow more definite conclusions to be drawn.

Although the findings presented in this thesis are not conclusive, they demonstrate that, as hypothesised, incentive effects do depend on certain factors. As illustrated in Table 2.1 of Chapter 2 (page 31), there are numerous variables that might influence behavioural responses to incentives. This thesis never aimed to examine the role of all of these, but chose to focus on those frequently discussed in the literature as being influential (Jochelson, 2007; Kane et al., 2004; Leung et al., 2002; Sutherland et al., 2008). Future research should attempt to examine the role of additional potential effect modifiers.

Confounding variables that influence the impact of incentives on health-related behaviours

As financial incentive schemes are rarely comprised of only one behaviour change technique (i.e. the use of rewards) without the use of appropriate control groups it is not possible to infer whether their effectiveness can be attributed to the incentives *per se* or to indirect influences, mediated by changes to some aspects of the processes involved in their delivery. Consequently, failure to standardise procedures between incentivised and control groups could lead to the effectiveness of offering rewards being exaggerated. Similarly, as it is assumed that attempts to falsify outcomes are more likely amongst incentivised individuals than non-incentivised individuals, in order to attain the rewards, the use of falsifiable outcome measures might also result in an overestimation of incentive effectiveness. Findings from the research presented in this thesis provide some support for the occurrence of these phenomena. Chapter 4 presented some evidence of significant positive incentive effects being rendered non-significant when focusing only on trials that had standardised study procedures between groups and used reliable outcomes measures. Chapter 5 provides an illustration of how a lack of standardisation between groups could affect outcomes, by exploring and identifying some of the

variables that could confound incentive effectiveness. These include differential engagement with, and provision of support services.

Although no firm conclusions can be drawn from the findings presented in this thesis with regards to the exact variables that might confound the impact of financial incentives on health-related behaviours, or the size of their effects, the evidence is arguably sufficient to highlight the need for future research to use appropriate control groups when evaluating incentive schemes. It also highlights the need for policy makers to base their decisions regarding the applicability of such schemes on evidence generated through well designed trials.

One potentially important aspect of incentives schemes, the effect of which this thesis did not address, is conditionality. To more precisely assess the effect of incentives, appropriate control groups should involve the provision of unconditional payments, so that both groups receive incentives but for only one these are contingent on behaviour change. This would allow researchers to disentangle the impact of offering rewards from the conditionality component of incentive schemes and determine whether paying people regardless of outcome is enough to produce desired effects. A few studies in the field of smoking cessation and drug abstinence have compared conditional and unconditional incentives but results have been inconclusive. Some findings suggest that conditional payments are needed to produce changes (e.g. Dunn, Sigmon, Thomas et al., 2008; Epstein, Hawkins, Covi et al., 2003; Heil et al., 2008; Higgins et al., 2004). Others, however, have found no differences between the two types of incentives (e.g. Lussier et al., 2006). Determining the exact components of incentive schemes that drive effectiveness is essential in designing optimal interventions. Future research should aim to clarify the potential differential effects of conditional and unconditional incentives.

The impact of financial incentives on the quality of people's decisions to engage in incentivised behaviours.

Findings from the research presented in this thesis provide no evidence to support concerns regarding the potential adverse consequences of financial incentives on the quality of people's decisions to engage in incentivised behaviours. Chapter 7 demonstrated that incentives do not undermine individuals' ability to make informed choices, as measured by their attitudes towards the incentivised behaviour and their knowledge of its health consequences. Chapter 8 showed that incentives also do not

undermine risk-information processing in the context of offering incentives to engage in a behaviour with potential adverse side-effects. On the contrary, incentives can signal risk to individuals. Before these findings are used as a basis to judge the applicability of financial incentive schemes for changing health-related behaviour, they require replication that will take into consideration the methodological limitations associated with the studies presented in Chapters 7 and 8.

Depending on one's ethical stance it is possible to argue that the evidence presented in Chapter 7 is not sufficient to conclude that incentives do not undermine the quality of decision-making processes. The specific argument would be that individuals participating in the trial may have had to overcome their negative attitudes in relation to the incentivised behaviour in order to attend their vaccination appointment. In other words, those who believed that the vaccination was harmful or bad might have changed their mind before arriving at the immunisation clinic, as a consequence of being offered incentives. The design of Study 4 could not allow for such an effect to be detected. Some may argue that this would constitute undue influence, which is the converse of informed consent or voluntary choice (Grady, 2005). As the trial did not assess informed choice prior to the offer of incentives, no relevant conclusions can be drawn. Future research should attempt to elucidate whether incentives alter who decides to engage in the behaviour or whether they alter the attitudes towards and/or knowledge of the target behaviour in all who are offered incentives, or a mixture of the two. The question, however, of whether or not changing someone's attitudes constitutes undue influence is an ethical one and beyond the scope of this thesis. Nevertheless, it should be noted that the influential role of attitudes on actual behaviour has been included in several psychological theories, including those focusing on health behaviours. For example, the Theory of Planned Behaviour (Ajzen, 1985) hypothesises that behavioural attitudes, along with other constructs, mediate the relationship between intention and behaviour. According to this, in order to change behaviour one must first change related attitudes. Consequently, many behaviour change techniques are designed to change attitudes, both explicit, such as persuasive communication (e.g. Fisher et al., 1996) and implicit, such as evaluative conditioning (e.g. Hollands et al., 2011). If getting someone to change his/her attitudes is undue influence, then all such techniques should be considered as having the potential to undermine the quality of decision-making processes, not just the use of incentives. Informed choice has been empirically operationalised as a choice that is in line with the decision-maker's attitudes and is

based on salient knowledge (Marteau, et al., 2001). Based on this definition, the findings presented in Chapter 7 showed that incentives did not undermine the quality of decisions as measured by informed choice. Had participants decided to get vaccinated regardless of their negative attitudes, this would have arguably constituted undue influence.

Remaining uncertainties

Although the research presented in this thesis has contributed towards addressing some of the uncertainties in relation to the use of incentives for changing health-related behaviours, there are still some questions that remain unanswered. Addressing these questions is essential before the use of financial incentives schemes is considered for application in health policies.

Some of the uncertainties are related to the aspects this thesis focused on (and can thus be considered drawbacks of the presented research, although the thesis limitations are elaborated on in the next section). These involve i) the role of potential effect modifiers not assessed by the research presented in this thesis, as well as the need to further elucidate those assessed herein and ii) the need for further examination of the variables that could confound the impact of financial incentives on health-related behaviours, including the need to clarify the potential differential impacts of conditional and unconditional incentives.

There is also uncertainty regarding whether financial incentives schemes can be delivered in ways that are cost-effective and acceptable. Apart from a few rare exceptions (e.g. Lahiri & Faghri, 2012), formal cost-effectiveness analyses of financial incentive schemes have not been conducted. The use of incentives also attracts criticism and raises moral concerns, for being potentially coercive, involving bribery and undermining autonomy (Ashcroft, 2011). Based on an ethical analysis of these concerns it has been argued that there is no good reason to assume that incentives constitute the above (Ashcroft, 2011). Nonetheless, evidence suggests that the public finds their use for health promotion less acceptable than other means (Parke, Ashcroft, Brown et al., 2011; Promberger et al., 2011), although these negative views are attenuated by evidence of effectiveness (Promberger et al., 2012). As there is limited evidence of effectiveness for the use of incentives for changing some health-related behaviours, we

can assume that at least in some contexts, the use of incentives might remain unacceptable. Consequently, what is found to be effective in studies will not necessarily be considered acceptable in practice. This is reflected in non-smokers rejecting an effective programme for smokers employed in the same organization (Volpp et al., 2011).

Consideration of the use of financial incentives should be informed by these issues and uncertainties.

Thesis strengths and limitations

Apart from the strengths discussed in relation to each of the studies in the respective chapters and summarised at the beginning of this chapter, the thesis has the advantage of having relied on a variety of methods to capture many aspects of the behavioural and cognitive consequences of using financial incentives to change health-related behaviours. This has enabled the thesis to clarify some of the uncertainties surrounding the use of incentives in health-related contexts. This in turn has arguably allowed for a more holistic approach to the evaluation of their use for changing health-related behaviour. Consequently, the findings have the potential to directly inform discussions regarding the application of incentives in health policies.

The primary limitation of the thesis, apart for those discussed in the preceding section and in relation to each individual study, is the lack of an in-depth assessment of the research objectives. Although choosing to address the various uncertainties surrounding the behavioural and cognitive consequences of financial incentive schemes has potentially resulted in a more holistic understanding of their use, at the same time it has precluded in-depth examination of any one of the research objectives. Furthermore, as the focus of the research in this thesis was to evaluate incentive effectiveness, the mechanisms by which incentives influence behaviour, were not assessed. Determining how incentives produce their effects is essential for designing optimal financial incentives schemes. It would also allow for an evaluation of existing theories of health behaviour. As discussed in Chapter 2, there is a growing interest in the role of unconscious processes and impulses in determining health behaviours. This is reflected in the development of dual-processing models, such as the Reflective-Impulsive Model (Strack & Deutsch, 2004). In theory, financial incentives are likely to operate on

behaviour both via the impulsive and reflective information processing systems. For example they might work by linking the target behaviour to a positively evaluated stimulus, thus strengthening the value associated with the behaviour, by shifting people's outcome expectations of the likely consequences of the target behaviour in a positive direction, by removing perceived barriers thus enhancing self-efficacy and perceived behavioural control, by rendering attitudes towards the target behaviour more positive or by facilitating allocation of limited cognitive capacity, in such a way as to achieve the now more highly valued target behaviour. The research presented in this thesis did not consider such mechanisms, so cannot be used to determine how these sets of influences may explain behaviour change in financial incentive schemes. This should be a focus of future research.

Concluding statement

The findings from the research presented in this thesis suggested that financial incentives are effective in changing health-related behaviours, but their effects do not always have clinical significance and are not sustained for more than a few months after incentive removal. The evidence demonstrated the role of recipients' level of deprivation in modifying the impact of financial incentives on repeated health-related behaviours, but not on one-off health-related behaviours, thus highlighting the potential of incentive schemes to help reduce health inequalities reflected in the socially patterned prevalence of non-communicable diseases. The findings also support the important role of incentive value in schemes targeting smoking cessation. Further research is necessary to further elucidate the role of other effect modifiers. The results provide some supports for the need to be cautious about attributing the impact of financial incentive schemes to incentives *per se*, as failure to control the variables and processes inherit in incentive delivery can confound incentive effectiveness. Possible confounding variables include differential engagement with, and provision of, support services. Finally, the results provide no evidence to suggest that financial incentives undermine the quality of people's decisions to engage in incentivised behaviours. The research in this thesis has reduced some of the uncertainties surrounding the behavioural and cognitive consequences of financial incentive schemes for changing health-related behaviour. It remains unclear whether incentive schemes can be delivered in ways that are cost-effective and acceptable and hence whether they can contribute to efforts to reduce the global burden of disease arising from unhealthy behaviour.

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Appendices

Appendix for Chapter 3

Appendix 3.1: PROSPERO registration record

THE UNIVERSITY of York
Centre for Reviews and Dissemination

NHS
National Institute for Health Research

PROSPERO International prospective register of systematic reviews

Personal financial incentives for changing habitual health-related behaviours: a systematic review and meta-analysis

Eleni Mantzari, Florian Vogt, Ian Shemilt, Yinghui Wei, Julian Higgins, Theresa Marteau

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Review question(s)

The objectives of this review are:

a) to assess the impact of personal financial incentives, six or more months after recruitment into an incentive scheme, on the performance of habitual health-related behaviours:

1. regardless of whether the incentive is still being offered at that time-point, and

2. when the incentive has been discontinued for at least one month.

b) to assess the extent to which the impacts reported in (a.1) and (a.2) are modified by:

1. behaviour type (smoking related vs. eating-related vs. physical activity-related),

2. incentive scheme characteristics (value of the incentive and whether attainment is certain vs. uncertain),

3. participant characteristics (level of social and material deprivation),

4. study characteristics (level of risk of bias relating to the standardization of study procedures across groups and the reliability of the outcome measures).

c) to assess the impact of personal financial incentives on motivation (intrinsic vs. extrinsic) to sustain outcomes after the incentive has been discontinued.

Searches

Electronic searches

We will conduct computerised searches of the following databases:

• MEDLINE (Ovid SP) (1948 to present)

• EMBASE (Ovid SP) (1974 to present)

• PsycINFO (Ovid SP) (1806 to present)

• CINAHL (EBSCO Host) (1981 to present)

• Cochrane Database of Systematic Reviews (The Cochrane Library) (1991 to present)

• Cochrane Central Register of Controlled Trials (CENTRAL), The Cochrane Library (1991 to present)

• SCOPUS (Elsevier) (1996 to present)

• Database of Abstracts of Reviews of Effects (The Cochrane Library) (1994 to present)

We will limit searches to studies of adults (18+ years of age). We will not apply restrictions with regard to the language of publication.

Searching other resources

In order to identify relevant ongoing and unpublished studies (e.g. dissertations, conference proceedings, working papers etc) we will search the following resources:

• HMIC (Ovid) (1983-present)

• Online clinical trials registers

o www.controlled-trials.com/mrct/ for UK trials

o clinicaltrials.gov/ct2/search for US trials

• Google Scholar (using a basic keywords such as “financial incentives” “smoking cessation”, “physical activity”, “weight-loss”; the first 1000 references will be scanned)

• Websites of key organisations in the area of health and incentives for health promotion

o Center for Health Incentives and Behavioral Economics (http://chibe.upenn.edu/)

o Healthy Incentives (www.healthyincentives.org.uk/)

o Weight Wins (www.weightwins.co.uk/)

o Departments of Health for England, Scotland, Wales and Northern Ireland

o Australian Federal and States Departments of Health

o The World Health Organisation

o United States Department of Health

In addition, we will search reference lists of eligible articles and contact key researchers and authors to identify further potentially eligible published, unpublished or ongoing studies.

Types of study to be included

We will include randomised controlled trials and cluster randomised controlled trials, which assess the impact of personal financial incentives on habitual health-related behaviours (smoking cessation, physical

activity and healthier eating, including alcohol consumption), and/or the proximal direct consequences of such behaviours. At least one comparison group in the trials must have been randomised to receive personal financial incentives and compared to either groups not receiving financial incentives and/or groups receiving financial incentives that differ in type and/or amount. Trials must have measured outcomes up to at least 6 months from the start of the intervention.

We will exclude all studies other than randomised controlled trials to minimise the risk of bias. We will only include studies with a minimum follow-up of 6 months because we are interested in the sustainability of habitual health-behaviours. Performance of the target behaviour at six months from the beginning of the intervention is the gold standard for smoking cessation (Hughes 2003). We are applying this criterion to the other target behaviours and outcomes for reasons of standardisation and comparability. We will include studies with multiple comparison groups in which participants are offered personal financial incentives that differ in specific characteristics, such as type and/or monetary value. We will include studies of the effects of multi-component interventions if two or more comparison groups are exposed to interventions that differ only in the offer of personal financial incentives (or in the offer of personal financial incentives that differ in specific characteristics). However, we will exclude studies of the effects of multi-component interventions in which personal financial incentives feature as one component, but the study design precludes collection of data relating to the independent effect(s) of incentives.

Condition or domain being studied

Poor habitual health-related behaviours, including tobacco smoking (Batty 2008; Teo 2006), poor diet-related behaviours (including the harmful use of alcohol) (Cox 2000; He 2007; Heidemann 2008) and lack of physical activity (Andersen 2000; Batty 2001), contribute greatly to the development of major risk factors for non-communicable diseases (NCDs). These disease, which include cardiovascular diseases, type 2 diabetes, certain types of cancers and chronic respiratory diseases, together account for more than 50% of preventable deaths worldwide (3four50.com; WHO 2011). The morbidity and mortality burden of NCDs affects people in all age groups, imposing large, increasing and avoidable costs in human, social and economic terms (Beaglehole 2011; WHO 2011).

The prevalence of NCD-related risk factors, such as obesity, hypertension, raised blood glucose and cholesterol, as well as the physiological or metabolic consequences of tobacco smoking, can be reduced by changing individuals' and populations' health-related habits, so as to promote certain healthy behaviours, including smoking cessation, physical activity and healthier eating (including the responsible consumption of alcohol). Achieving this could in turn reduce the prevalence and burden of NCDs (Katz 2009).

Modifying habitual health-related behaviours however, is difficult. Although many people report that they want to change their behaviour to improve their health, most find it difficult to implement and maintain the necessary changes (Ogden 2007; Sutton 1998).

One possible way to improve individuals' health-related behaviours is through the use of personal financial incentives. Personal financial incentives are increasingly being considered and applied in health policies around the world in an attempt to promote health-enhancing behaviours (Le Grand 2007; Largarde 2007). Several aspects of the effectiveness of personal financial incentives to promote health-related behaviours however, remain unclear (Marteau 2009). For example, although there is evidence that they can be effective in promoting non-habitual health-related behaviours, such as attendance at clinic appointments, uptake of immunisations, mammography screening and tuberculosis screening, and adherence to healthcare treatments (Sutherland 2008), the currently limited evidence base indicates that the impact of such incentives on more habitual health-related behaviours, such as smoking-, diet- and physical activity-related behaviours, is less straightforward (Sutherland 2008). Furthermore, evidence for the sustained effectiveness of personal financial incentives beyond the period of intervention remains to be established

(Marteau 2009).

Research is needed which will synthesise the available evidence across various habitual health-related behaviours, in order to establish the exact conditions under which incentives are effective in changing such behaviours, i.e. to determine which types of personal financial incentives, for which participants and which behaviours (or related outcomes) result in greatest changes. Furthermore there is a need to determine whether these behaviour changes are:

(a) sustained after the incentive is discontinued;

(b) maintained for the duration incentives are offered but "crowd-out" intrinsic motivation, making it less likely than before incentivisation that people engage in the healthy behaviour after the incentive is discontinued; or

(c) maintained only for the duration incentives are offered with the behaviour returning to baseline levels after they are discontinued.

There is also a need to elucidate the circumstances under which each possibility might occur.

This review will address these gaps in the literature by focusing on the use of incentives for changing poor habitual health-related behaviours, i.e. tobacco smoking, physical inactivity and unhealthy eating, including the harmful drinking of alcohol, and for promoting healthier habitual behaviours, i.e. smoking cessation, physical activity and healthier eating, including the responsible drinking of alcohol. In addition, it will consider the impact of personal financial incentives on the proximal indicators of eating behaviour and performance of physical activity (body weight, body mass, blood glucose, blood cholesterol, blood lipids) (i.e. major, modifiable physiological or metabolic risk factors for NCDs). In will also attempt to determine the variables that modify the effect of financial incentives on habitual health-related behaviours.

Although various existing reviews have examined the use of incentives for changing health-related behaviour, no single review has focused explicitly on habitual health-related behaviours and has asked the same questions as those proposed in this review. Although the proposed review has some overlap with existing reviews in terms of the included studies, it will differ through the inclusion of further trials and the analysis of variables which hitherto have remained unexamined. By building upon existing reviews it will endeavour to produce a more complete and comprehensive picture of the impact of personal financial incentives allowing generalizations across habitual health-behaviours, both about the impact and the modifiers of such impact.

Participants/ population

Adults aged 18 years or over (no restrictions for socio-economic or clinical characteristics or prognostic factors).

Given the prediction that the impact of personal financial incentives is moderated by recipients' level of social and material deprivation, (e.g. Sutherland 2008), we will classify participants at the study level as either highly social and materially deprived ("High") or not highly socially and materially deprived ("Other").

Intervention(s), exposure(s)

Interventions will consist of the offer of personal financial incentives, provided directly to patients or consumers (as opposed to health-care providers), contingent upon: smoking cessation; performance of a

pre-specified level of physical or sedentary activity; achievement of a pre-specified target relating to the eating of healthier or less healthy foods and drinking of alcoholic beverages; achievement of a pre-specified calorific or nutritional target related to nutrient intake; achievement of a pre-specified level of energy expenditure; and/or achievement of a pre-specified level of weight loss.

We will exclude incentives of little or no monetary value and those of symbolic value(e.g. certificates, stickers, badges, key-rings, t-shirts, caps, hats or mugs) and incentives that are not contingent on individual performance of the target behaviour(s) or achievement of the target outcome(s) (e.g. consumer sales promotions, direct pricing, income transfer programs, tax credits).

For the purposes of this review, we will classify personal financial incentives according to two dimensions, presented in order of expected importance:

1. the monetary value of the financial incentive (whether high or low; see 'Data Extraction'). This variable has been frequently proposed as an important modifier of the effect of financial incentives on health-related behaviour (e.g. Sutherland 2008; Lussier 2006; Paul-Ebhohimhen 2008)

2. whether attainment of the financial incentive is certain (i.e. the possibility of obtaining the incentive depends only on performance of the pre-specified target behaviour or achievement of the pre-specified target outcome) vs. uncertain (i.e. the possibility of obtaining the incentive depends both on performance of the pre-specified target behaviour or achievement of the pre-specified outcome and chance. Performance of the pre-specified target behaviour or achievement of the pre-specified target outcome entitles participants' to the possibility of winning the incentive by being entered into a draw/lottery/sweepstake/competition/contest. Actually attaining the incentive however, depends on chance). Assessing this distinction is important, as research in related areas suggests that participants might respond differentially to a certain vs. an uncertain incentive (e.g. Leung 2002).

Comparator(s)/ control

Eligible comparison groups will be those in which participants are exposed to:

a) no treatment;

b) the same treatment as the incentivised group(s), but without the offer of a personal financial incentive; or

c) a personal financial incentive that differs from that offered to the treatment group in type (i.e. certain vs. uncertain), and/or monetary value.

Context

There will be no restrictions relating to the geographical or organisational setting(s) or context(s) in which the intervention(s) are provided.

Outcome(s)

Primary outcomes

Achievement of the desired habitual health-related behaviour or related outcome – i.e. performance of the target health behaviour or achievement of the target outcome, at least 6 months after recruitment into the personal financial incentives scheme and one month after the personal financial incentive has been discontinued, where the target behaviour or related outcome refers to that for which the incentive has been offered.

For each of the habitual health-behaviours we are considering, we are interested in the following outcomes:

Smoking cessation:

• cessation (dichotomous - measured by carbon monoxide reading or cotinine test of urine, saliva or blood).

Physical activity:

• achievement of target level or frequency of physical activity (dichotomous - measured objectively, e.g. by pedometer, activity record, diary, questionnaire or scale)

Eating healthier foods:

• achievement of target amount or frequency of specified healthier food(s)/drink(s) (including alcoholic beverages) consumed (dichotomous - measured objectively, e.g. by diet record or diary, food frequency questionnaire)

Eating unhealthier foods:

• achievement of target amount or frequency of specified unhealthier food(s)/dink(s) (including alcoholic beverages) consumed (dichotomous - measured objectively, e.g. by diet record or diary, food frequency questionnaire)

Proximal direct consequences of eating behaviour and/or performance of physical or sedentary activity:

• achievement of target calorific or nutritional profile of food(s)/drink(s) consumed (dichotomous - measured objectively, e.g. based on diet record or diary, food frequency questionnaire)

• achievement of target level of energy expenditure (dichotomous - measured objectively, e.g. based on activity record, diary, questionnaire or scale)

• achievement of target level of cardio-respiratory fitness (dichotomous - measured by maximal oxygen intake VO2 max)

Risk factors for NCDs:

• achievement of target body weight/body fat distribution/body mass/related proxies (e.g. leptin, adipocytokines and other obesity or inflammatory markers), given target weight loss/fat loss/body mass/related proxies if applicable (dichotomous - measured objectively)

• achievement of target blood cholesterol level/blood lipid profile/blood glucose level (dichotomous - measured objectively)

Motivation (intrinsic vs. extrinsic) to engage in target health-related behaviour (dichotomous- measured using self-report questionnaires)

Where these outcomes are not available, we will record and dichotomise the following continuous

outcomes:

Physical activity:

• amount of physical activity (continuous - measured objectively, e.g. number of minutes or steps performed)

Eating healthier/unhealthier foods:

• amount of healthy/unhealthy food(s)/drink(s) (including alcoholic beverages) consumed (continuous - measured objectively, e.g. by diet record or diary, food frequency questionnaire)

Proximal direct consequences of eating behaviour and/or performance of physical or sedentary activity:

• amount of calories from food(s)/drinks(s) consumed (continuous -measured objectively, e.g. based on diet records or diary, food frequency questionnaire)

• level of energy expenditure (continuous - measured objectively, e.g. based on activity records, diary, questionnaire or scale)

• level of cardio-respiratory fitness (continuous - measured by maximal oxygen intake VO2 max)

Risk factors for NCDs:

• level of weight loss/fat loss/body mass improvement (continuous - measured objectively)

• level of blood cholesterol/blood glucose/blood lipid (continuous - measured objectively)

Psychological variables:

• Motivation (intrinsic vs. extrinsic) to engage in target health-related behaviour (continuous- measured using self-report questionnaires)

We will extract only dichotomous outcome data and present it in tables describing and summarising the results of each study. Where dichotomous data are not available, we will extract continuous outcome data and dichotomise it, by converting SMDs directly to odds ratios.

We will deal with varying time-points of assessment of the outcome by creating time-assessment categories. These will begin at six months after recruitment into an incentive scheme and will consist of six month intervals (i.e. 6 months, 6-12 months, 12-18 months, 18-24 months etc since recruitment). We will also create time-assessment categories for after removal of the incentive. These will consist of one month intervals between 1 and 3 months, a three month interval between 3 and 6 months and six month intervals thereafter (i.e. 1-2 months 2-3 months, 3-6 months, 6-12 months, 12-18 months, etc. after discontinuation of incentives). We will calculate odds ratios for outcomes.

The extraction and (where necessary and possible) conversion of outcome data into dichotomous measures is intended to allow an overall estimate of behaviour change across the three sets of target behaviours.

Secondary outcomes
None

Data extraction, (selection and coding)
Two authors (EM and FV) will independently extract all data. If outcome data are unavailable or are not presented in the published full-text reports of individual studies in the forms pre-specified in 'Types of Outcome Measures' (i.e. dichotomous data), or we cannot converted them to the necessary format, we will contact study authors with a request to provide these data. The first author (EM) will reconcile the two sets of independently completed data extraction forms. If there are inconsistencies between the two sets, we will re-check extracted data and verify them against the corresponding full-text study report. If uncertainly remains, the two data extractors will meet to discuss and reach a consensus. If consensus cannot be reached a final decision will be made following discussion with a third author (IS).

To allow for assessment of the role of the pre-specified moderating variables (i.e. incentive scheme characteristics (incentive value and certainty) and participants' level of social and material deprivation)), during the data extraction process we will categorise incentives and their recipients at the study level. Specifically, we will classify incentives according to:

a) their value i.e. low (>$400) vs. high (=< $400).We will make judgements of "High value" if the total value of incentives is larger than the minimum weekly income required to be earned per household for individuals to be above the USA poverty threshold. We have chosen to follow USA guidelines because currently the majority of research in this field has been conducted in this country. The average number of family members per household in the USA is three (rounded off to the nearest figure) (United States Census Bureau, 2011) with the equivalent poverty threshold set at approximately $18530 annually ($386 weekly) per household (US Department of Health & Human Services, 2011).Based on this, we will classify the value of incentives worth $400 (total value) and above as "high" and those worth $400 (total value) and below as "low".

b) their type, i.e. certain (all incentives, such as cash, deposits, gifts, vouchers etc., excluding lotteries) vs. uncertain (i.e. lotteries)

We will collect information on participants' level of social and material deprivation and make judgements based on any relevant information that is available in the included studies (e.g. income, employment, education, ethnicity, SES scores). We will aggregate this information to allow studies to be categorised as either highly social and materially deprived ("High") or not highly socially and materially deprived ("Other"). We have chosen this categorisation because our primary interest is to determine whether incentives are more effective for the most deprived, rather than to assess the level of effectiveness associated with each level of deprivation. We will make categorisations at the study level to allow for between-studies comparisons. We will make judgements of "High deprivation" when any or all of the following conditions are met:

1. Majority of study participants have not completed high school or the mean number of years in education is less than 12 years

2. Majority of study participants earn less than $ 20,000/year ($1,666/month), or the mean reported income is less than $20,000/year or the majority of participants are allocated to the lowest income category,

3. Majority of study participants are unemployed or in unskilled, semi-skilled, skilled, or blue collar jobs

4. Majority of participants have a low SES score or the mean SES score is low. Decisions about whether SES scores are indicative of high deprivation will be made by referring to the scoring of the scale used and any related instructions for interpreting these scores.

5. Majority of study participants are non-White. This information will be used when income, education, occupation and SES have not been measured, or when the information provided by these variables does not allow for definite categorisations (e.g. income is low but education is borderline, such as just above 12 years) Judgments of high deprivation based on these variables will not be affected if the sample is predominantly white.

6. Majority of study participants are underinsured or lacking insurance, receiving Medicaid, or attending public clinics or Women Infant and Children (WIC) programmes.

7. Majority of study participants are living in an area of deprivation, or receiving welfare benefits (including, in the UK, free school meals).

If the information provided by two variables is contradictory, e.g. income is low but education is high, then we will take into account the information provided by a third variable, such as occupation or ethnicity, to make a judgment.

If no relevant information is reported in the paper, then we will contact authors and enquire about the availability of relevant data.

Risk of bias (quality) assessment

We will assess risk of bias of included studies at the outcome level. For both randomised controlled trials and cluster randomised trials, we will assess risk of bias by applying of the Cochrane Collaboration risk of bias tool (Higgins 2011). We will assess the risk of bias for the following domains

Selection bias:

1. Random sequence generation

2. Allocation concealment

Performance bias:

1. Blinding of participants and personnel

We do not expect knowledge of intervention allocation by participants to lead to performance bias. In fact, blinding of participants is usually not relevant in studies assessing the impact of financial incentives on health-related behaviours. For the intervention to work participants need to be aware of their entitlement to incentives, so that they can perform the necessary behaviour/achieve the outcome necessary for their attainment. Consequently, we will not consider studies in which participants were not blinded to be at high risk of bias. We will make risk of bias judgements regarding blinding of personnel (and whether their knowledge of the intervention may have altered the way they interacted with participants, and has thus influenced outcomes)

2. Standardization of study procedures

A related potential source of performance bias specific to trials assessing the impact of financial incentives on health-enhancing behaviours that we will assess, is whether studies have controlled for the additional processes inheret in the delivery of the incentive, compared to regular treatment: Attainment of incentives often requires additional involvement, on behalf of both participants and personnel, in the form of frequent

clinical appointment attendance, monitoring of the formers' performance etc, which may confound the impact of financial incentives, leading to an overestimation of their effectiveness.

We will make judgements of low risk of bias when study procedures have ensured that all processes are standardised between groups (i.e. all participants attend an equal number of clinical appointments and their performance is monitored a comparable number of times) apart from the provision of financial incentives contingent on performance of a target behaviour/achievement of a target outcome. A lack of such standardisation will result in judgments of high risk of bias, whereas we will make a judgement of unclear risk of bias when there is insufficient information regarding the procedures relating to the non-intervention groups. We will incorporate this risk of performance bias assessments into the analysis to determine whether the impact of financial incentives co-varies with such between-study differences.

Detection bias

1. Blinding of outcome assessment

In trials assessing the impact of financial incentives on health-related behaviours outcome assessors are often responsible for disseminating the incentives. We expect it to be often the case therefore that assessors are aware of which group a participant has been allocated to. Whether or not a lack of blinding of outcome assessment leads to bias will largely depend on the robustness/reliability of the outcome measure used in each study, and the extent to which it requires judgements on behalf of the outcome assessors.

2. Reliability of outcome measure

A related source of detection bias, the risk of which we will assess in studies included in this review, concerns the method of outcome assessment employed and the extent to which it is reliable or can be deceived. We expect easily falsifiable measurements to be deceived more by participants in conditions where delivery of the financial incentive is contingent on the outcome of the assessment, thus leading to bias. We will consider studies in which the outcome assessment relies purely on self-report measures at high risk of bias, compared to those which include an objective outcome measure, such as a biochemical indicator. For example, in the case of physical activity and healthier eating, we will consider studies at low risk of bias if they rely on biochemical indicators such as weight-loss, maximal oxygen intake, blood lipid/glucose profiles, as opposed to diaries or questionnaires. With regards to smoking cessation, we will consider studies at low risk if smoking status is measured using the Russell standard (West 2005), as opposed to relying on self-report or monitoring of carbon monoxide level. We will incorporate these risk of detection bias assessments into the analysis to determine whether the impact of financial incentives co-varies with the type of method used to assess outcomes.

Attrition bias

Incomplete outcome data

We expect that in studies assessing the impact of financial incentives on health-related behaviour, greater levels of attrition will be observed in non-incentivised groups compared to the incentivised groups. We will analyse originally dichotomous and/or dichotomised outcome data missing due to participant drop-out via intention-to treat analysis, with a conservative assumption being made that participants dropping-out have not sustained (or achieved) the target behaviour or related outcome.

Reporting bias

1. Selective outcome reporting

2. Other sources of potential bias

For cluster randomised trials we will also consider the following:

Recruitment bias

For this domain, we will make high risk of bias judgements for studies where participants were recruited into clusters after randomisation was completed. We will make low risk of bias judgements for studies where recruitment was completed before randomisation. We will make unclear risk of bias judgments for studies where there is a lack of information regarding the order of recruitment and randomisation.

Two authors will independently apply the risk of bias tool. Additionally, each author will collect and record the source of information for each risk of bias judgement (e.g. quotation or summary of information from trial report). Where judgements are based on assumptions made on the basis of information provided outside publicly available documents, this should be stated. Any inconsistencies between the two authors with respect to coding judgements or information in support of judgements will be resolved by consensus. If consensus cannot be reached a final decision will be made following discussion with a third author

Strategy for data synthesis

If possible, we will combine data from cluster-randomised controlled trials and individually randomised controlled trials for the analysis. We will consider cluster-randomised controlled trials that have not taken their design into account (i.e. have performed statistical methods that allow analysis at the level of the individual while accounting for the clustering in the data) at high risk of bias, and will perform corrected analyses where possible, if the following information can be extracted:

• the number of clusters (or groups) randomised to each intervention group; or the average (mean) size of each cluster;

• the outcome data ignoring the cluster design for the total number of individuals (for example, number or proportion of individuals with events, or means and standard deviations); and

• an estimate of the intracluster (or intraclass) correlation coefficient (ICC).

We will deal with data from studies with multiple treatment arms (i.e. in which participants have been randomised to different types of incentives) by conducting multivariate analyses, whereby we will model direct comparisons between each treatment arm and the control. We will combine data from multiple control groups (i.e. groups not offered treatment and groups offered the same treatment as the incentivised groups but without the offer of financial incentives).

We will conduct a narrative review, describing the interventions, review/study populations, review/study characteristics and the impact of financial incentives for changing the three habitual health-related behaviours of interest, namely smoking cessation, healthier eating, including alcohol consumption and physical inactivity.

Our statistical analysis will consist of a meta-regression, which will incorporate multivariate analyses for multiple treatment studies (in which participants are allocated to incentivised groups differing with respect

to the type and/or size of the incentive offered), using metareg (White 2011). The analysis will involve the following stages:

Stage 1: The effect of incentives (all combined vs. control) on health-related behaviour (all combined) will be estimated through a standard meta-analysis

Stage 2: A meta-regression will be performed with behaviour type (i.e. smoking cessation, physical activity, healthier eating, weight-loss) as a covariate.

Stage 3: A meta-regression will be performed with incentive-scheme characteristics as covariates (certain vs. uncertain and value of incentive). A multivariate framework will be used for studies with multiple treatment arms in order for direct comparisons between each treatment arm and the control to be modelled (i.e. for studies with groups A' vs. A" vs. C the multivariate framework will be used to estimate the effects of A' vs. C and A" vs. C). Interaction terms will be included to investigate the joint effects of the incentive scheme characteristics (certain vs. uncertain and value of incentive).

Stage 4: A meta-regression will be performed with participant characteristics (i.e. level of material deprivation) and risk of bias (i.e. risk of performance and detection bias) as covariates. Behaviour type and incentive scheme characteristics will be re-entered into the model if they are found to be important predictors at stages 2 and 3 respectively.

We will calculate pooled effect sizes with 95% confidence intervals using random effects models. Given that we expect effect sizes to vary between studies according to the characteristics of the studied populations and target behaviours or related outcomes, random- as opposed to fixed-effect models are, ex ante, considered likely to be more appropriate for the purposes of this review

Analysis of subgroups or subsets

See Strategy for data synthesis

Dissemination plans

We will write up and submit our results for publication in a peer-review journal. We will also present our results at relevant conferences.

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None known

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Stage of review at time of this submission	Started	Completed
Preliminary searches	No	Yes
Piloting of the study selection process	No	Yes
Formal screening of search results against eligibility criteria	No	Yes
Data extraction	No	Yes
Risk of bias (quality) assessment	No	Yes
Data analysis	No	Yes

Appendix 3.2: Identifying and analysing overlap of current review with relevant existing reviews

Classification of existing Cochrane and Non-Cochrane reviews of the impact financial incentives on repeated health behaviours, with the purpose of identifying aspects of overlap with current review

		Target Behaviour								Intervention				Review Type		Analysis		Search Strategy		Analysis of modifiers		
		Smoking				Weight loss (Diet/PA)	PA	Alcohol	Multi incl. SM/D/PA/A	Incentives				Cochrane	Non-Cochrane	Narrative	Meta-analysis	Systematic	Unsystematic	IC	ID	BT
		ADLs		Teens/Kids	Pregnant					Cash/ Voucher /Prize	Deposit	Lottery	Multi Incl $$$									
		Work	General																			
R	0*	✓	✓	-	✓	✓	✓	✓	-	✓	✓	✓	-	-	-✓	✓	✓	✓	-	✓	✓	✓
e	1	✓	✓	-	-	-	-	-	-	✓	✓	✓	-	✓	-	-	✓	✓	-	✓	-	-
v	2	-	-	-	-	-	-	✓	✓	✓	✓	-	✓	✓	-	✓	-	✓	-	-	-	-
i	3	-	-	✓	-	-	-	-	-	?	?	?	-	✓	-	?	?	✓	-	?	?	?
e	4	-	-	-	✓	-	-	-	-	✓	-	✓	✓	✓	-	-	✓	✓	-	-	-	-
w	5	-	✓	-	-	-	-	-	-	-	-	✓	-	✓	-	✓	-	✓	-		✓	-
	6	-	-	-	-	✓		-	-	✓	-	-	✓	✓	-	-	✓	✓	-	-	-	-
	7	-	-	-	-	-	-	-	✓ not SM/D/PA/A	✓ CCT	-	-	-	✓	-	✓	-	✓	-	-	-	-
	8	✓	-	-	-	-	-	-	-	✓	✓	✓	✓	✓	-	✓	-	✓	-	-	-	-
	9	-	✓			-	-	-	-	✓	-	✓	-	-	✓	✓	-	✓	-	✓	-	-
	10	-	-	-	-	-	✓	-	-	✓	-	✓	✓	-	✓	✓	-	✓	-	-	-	-
	11	✓	✓	✓	✓	-	-	-	-	✓	✓	✓	-	-	✓	✓	-	✓	-	✓	-	-
	12	✓	-	-	-	-	-	-	-	✓	-	✓	✓	-	✓	✓	-	✓	-	-	-	-
	13	✓	-	-	-	✓	✓	-	✓	✓	-	-	✓	-	✓	✓	-	-	✓	-	-	-
	14	-	-	-	-	✓	-	-	-	N/A	N/A	N/A	✓	-	✓	✓	-	-	✓	-	-	-
	15	-	-	-	-	✓ D	-	-	-	✓	✓	✓	✓	-	✓	✓	-	✓	-	-	-	-
	16	✓	-	-	-	-	-	-	-	✓	-	✓	✓	-	✓	✓	-	-	✓	-	-	-
	17	-	-	-	-	✓	✓	-	-	✓	✓	✓	✓	-	✓	✓	-	✓	-	-	-	-
	18	-	✓	✓	✓	-	-	✓	✓	✓	-	✓	-	-	✓	✓	-	-	✓	-	-	-

	19	-	✔	✔	✔	-	-	✔	✔	✔	-	✔	✔	-	✔	✔	-	-	✔	-	-	-
	20	-	-	-	-	✔	-	-	-	**N/A**	**N/A**	**N/A**	✔	-	✔	✔	-	✔	-	-	-	-
	21	-	-	-	-	-	-	-	✔	✔	✔	✔	-	-	✔	✔	-	✔	-	✔ **M**	✔ **M**	✔ **M**
	22	-	-	-	-	-	-	-	✔	✔	✔	✔	-	-	✔	✔	-	✔	-	✔	-	✔ **S vs C**
	23	-	-	-	-	✔	-	-	-	**N/A**	**N/A**	**N/A**	✔	-	✔	✔	-	-	✔	-	-	-
	24	-	✔	-	✔	-	-	-	-	**N/A**	**N/A**	**N/A**	✔	-	✔	✔	-	✔	-	-	-	-
	25	-	✔	✔	✔	-	-	-	-	✔	✔	-	-	-	✔	✔	-	-	✔	✔ **M**	-	-
	26	-	-	-	-	✔	✔	-	-	✔	✔	✔	✔	-	✔	✔	-	-	✔	-	-	-
	27	-	-	-	-	-	-	✔	✔ **(A & other substance use)**	✔	-	-	-	-	✔	-	✔	✔	-	✔	-	✔
	28	✔	-	-	-	-	-	-	-	✔	-	✔	-	-	✔	✔	-	✔	-	✔ **M**	-	-
	29	-	-	-	-	✔ **D**	✔	-	-	✔	-	✔	✔	-	✔	✔	-	✔	-	-	-	-
	30	-	-	-	-	✔	-	-	-	**N/A**	✔	-	✔	-	✔	✔	-	✔	-	-	-	-
	31	-	-	-	✔	-	-	-	-	✔	-	-	✔	-	✔	✔	-	✔	-	-	-	-
	32	✔	-	✔	✔	-	-	-	-	✔	✔	✔	✔	-	✔	✔	-	-	✔	-	-	-
	33	-	-	-	-	✔	-	-	-	✔	✔	-	-	-	✔	-	✔	✔	-	✔	-	-
	34	-	-	-	-	✔	-	-	-	✔	✔	-	✔	-	✔	-	✔	✔	-	-	-	-
	35	-	✔	-	✔	-	-	✔	✔ **SM/A & other substances**	✔	-	-	-	-	✔	-	✔	✔	-	✔	-	✔
	36	✔	-	-	-	-	-	-	-	**N/A**	**N/A**	**N/A**	✔	-	✔	-	✔	✔	-	-	-	-
	37	-	-	-	-	✔	✔	-	✔ **exc. SM**	✔	✔	✔	-	-	✔	✔	-	-	✔	✔ **M(S vs. C)**	✔ **M**	✔ **M**
	38	-	-	-	-	✔	-	-	-	✔	✔	✔	-	-	✔	✔	-	✔	-	**-!**	**-!**	-

ADLs=Adults
SM= Smoking
D=Die**t**
PA=Physical activity
A=Alcohol consumption
IC= Incentive Characteristics
ID= Individual Differences
BT= Behaviour Type
M=mentioned (not analysed)
S=simple behaviour; **C=** complex behaviour

*Review **0** in the table refers to our proposed review, included for reasons of comparison.

Reviews that include trials of incentives for changing repeated health-related behaviours

Cochrane reviews

1. Cahill, K. & Perera, R. (2011). Competitions and incentives for smoking cessation. Cochrane Database of Systematic Reviews, 4, CD004307

2. Bosch-Capblanch, X., Abba, K., Prictor, M., et al. (2007). Contracts between patients and healthcare practitioners for improving patients' adherence to treatment, prevention and health promotion activities. Cochrane Database of Systematic Reviews, 2, CD004808.

3. Thomas D, & Johnston V. (2010) Incentives for preventing smoking in children and adolescents. Cochrane Database of Systematic Reviews, 8, CD008645.

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5. Cahill K, Perera R. (2008), Quit and Win contests for smoking cessation. Cochrane Database of Systematic Reviews, 4, CD004986.

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Non-Cochrane reviews

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38. Wall, J., Mhurchu, C. N., Blakely, T., Rodgers, A., & Wilton, J. (2006). Effectiveness of monetary incentives in modifying dietary behavior: A review of randomized, controlled trials. *Nutrition Reviews,* 64, 518-531

Analysis of overlap of current review with existing reviews

We identified 38 reviews (of which eight are Cochrane reviews, including one protocol) that are relevant to the proposed review. Twenty-eight of the 38 reported a systematic search strategy. Eight reviews (three Cochrane and five non-Cochrane) performed meta-analyses, upon which conclusions were drawn, with the remaining 30 relying on narrative analyses.

All of these reviews evaluate, to varying degrees, the impact of financial incentives on one or repeated health-related behaviours. Sixteen out of 38 focused on the impact of financial incentives on health related behaviours. The remaining 22 focused on a range of interventions, of which financial incentives featured as just one. However, all existing reviews differ from the current review in various ways.

Of the sixteen reviews that explicitly evaluated the impact of financial incentives, nine [three Cochrane (1, 3 and 5) and six non-Cochrane (9, 11, 25, 28, 32 and 38)], focused on a single repeated health-related behaviour, including smoking (Review 1, 3, 5, 9, 25, 28) and dietary preferences (Reviews 33, 38). Consequently these reviews are not informative about the modifying role of behaviour type. Furthermore, only five of these reviews attempted to analyse how the impact of financial incentives on health-related behaviour is modified by incentive scheme characteristics (Reviews 1, 9, 11, 25, 33), and only one described certain individual differences that were characteristic of participants achieving the pre-specified behaviour (Review 5).

Seven reviews, one Cochrane (7) and six non-Cochrane (18, 21, 22, 27, 35 and 37) focused explicitly on the impact of financial incentives on multiple health-related behaviours (as opposed to just one), including smoking, dietary preferences, alcohol consumption and physical activity. However, only two (27, 35) systematically analysed the role of certain (but not all) potential modifiers, i.e. incentives scheme characteristics, and behaviour type.

Of the 22 reviews that did not focus exclusively on financial incentives, four were Cochrane (2, 4, 6, and 8) and eighteen non-Cochrane (10, 12, 13, 14, 15, 16, 17, 19, 20, 23, 24, 26, 29, 30, 31, 32, 34, 36) reviews. In these reviews, financial incentive schemes featured as just one of several interventions targeting one, or more (as in the case of reviews 2, 13 and 19) specific health problems, such as obesity (Review 6, 14, 15, 17, 20, 23, 26, 29, 30, 34), smoking (Review 4, 8, 12, 13, 16, 24, 31, 32, 36), alcohol (Reviews 2, 19) and physical inactivity (Reviews 10 and 29). The aim of these reviews was to evaluate the general effectiveness of various interventions, without necessarily reporting on the independent effect of financial incentives. Furthermore, these reviews did not include any analyses on the potential modifying role of incentive scheme characteristics or participants' individual differences. Moreover, because they focused on a single health-related behaviour, they are not informative about the modifying role of behaviour type.

In summary no single existing review has asked the same questions as the current review. Although the current review has some overlap with existing reviews in terms of

the included studies, it differs through the inclusion of further trials and the analysis of variables which hitherto had remained unexamined. By building upon existing reviews it produces a more complete and comprehensive picture of the impact of personal financial incentives allowing generalizations across behaviours both about the impact and the modifiers of such impact.

Appendix for Chapter 4

Appendix 4.1: Search Strategy

MEDLINE (Ovip SP) Search strategy

1. exp Smoking OR Smoking.mp

2. exp Smoking Cessation OR smoking cessation.mp

3. exp Tobacco Use Cessation

4. (quit* adj3 smok*).mp

5. (smok* adj3 abstinen*).mp

6. (cut* down adj3 cigarette*).mp

7. (smok* adj3 reduc*).mp

8. (cigarette* adj3 reduc*)

9. (CO adj3 reading*).mp

10. (CO adj3 level*).mp

11. (carbon monoxide adj3 reading*)

12. (carbon monoxide adj3 level*) OR cotinine adj3 level*.mp OR nicotine adj3 addict*

13. tobacco.mp OR exp Tobacco)

14. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 5 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13

15. exp Exercise **OR** exercise.mp

16. (physical adj3 exercis*).mp

17. (physical adj3 train*).**mp**

18. (physical adj3 activ*).mp

19. (physical adj3 inactiv*).mp

20. (sedentary adj3 behavio?r*).mp **OR** (sedentary adj3 lifestyle*).mp

21. (sedentary adj3 life-style*).

22. (sedentary behavio?r* adj3 modif*).mp

23. (sedentary lifestyle* adj3 modif*).mp

24. (sedentary life-style* adj3 modif*).

25. exp Physical Education and Training

26. gym*.mp

27. exp Sports

28. (gym* adj3 attend*).mp

29. exp Walking

30. exp Running

31. exp Jogging

32. fitness.mp

33. exp Physical Fitness

34. walk*

35. run*

36. jog*

37. (aerobic* adj3 exercis*)

38. (aerobic* adj3 activit*)

39. (aerobic* adj3 train*)

40. cardiorespiratory adj1 fitness.mp

41. exp Swimming

42. swim*.mp

43. 15 OR 16 OR 17 OR 18 OR 19 OR 20 OR 21 OR 22 OR 23 OR 24 OR 25 OR 26 OR 27 OR 28 OR 29 OR 30 OR 31 OR 32 OR 33 OR 34 OR 35 OR 36 OR 37 OR 38 OR 39 OR 40 OR 41 OR 42

44. exp Diet **OR** diet*

45. Diet therapy

46. exp Food

47. exp Beverages

48. nutrition.mp

49. exp Nutrition assessment

50. (nutrition* adj3 choice*).mp

51. (nutrition* adj3 preference*).mp

52. (healthy adj3 eating).mp

53. (healthy adj3 diet).mp

54. (diet* adj3 preference*).mp

55. (diet* adj3 behavio?r*).mp

56. (food* adj3 preference*).mp

57. (food* adj3 choice*).mp

58. (diet* adj3 choice*).mp

59. (nutrition* adj3 habit*).mp

60. (diet* adj3 habit*).mp

61. (diet* adj3 modif*).mp

61. (food* adj3 habit*)

62. (eat* adj3 habit*).mp

63. (food* adj3 consum*).mp

64. (vegetable* adj3 consum*).mp

65. (vegetable* adj3 intake*).mp

66. (fruit* adj3 consum*).mp

67. (fruit* adj3 intake*).mp

68. (beverage* adj3 consum*)

69. (fat* adj3 consum*).mp

70. (fat* adj3 intake*)

71. weight-loss.mp

72. weight loss mp.

73. exp Weight Loss

74. (weight adj3 decrease*).mp

75. (weight adj3 reduc*).mp

76. (calorie* adj3 intake*).mp

77. (calorie* adj3 consum*).mp

78. (calorie* adj3 decrease).mp

79. (calorie* adj3 reduc*).mp

80. (calorie* adj3 cut*down).mp

81. (calorie* adj3 control*).mp

82. (fat* adj3 reduc*).mp

83. (fat* adj3 decrease*).mp

84. (fat* adj3 loss*).mp

85. exp Obesity

86. exp Body Mass Index

87. exp Body Weight

88. body weight.mp

89. BMI.mp

90. exp Overweight

91. exp Obesity, Morbid

92. obes*.mp

93. exp Feeding Behavior

94. overweight.mp

95. (weight adj3 control*).mp

96. (waist-hip adj1 ratio).mp

97. (skinfold adj1 thickness).mp

98. (obesity adj3 prevent*).mp

99. exp Eating

100. exp Hypherphagia OR hyperphagia.mp

101.overeat*.mp

102. exp Energy Intake

103. energy intake.mp

104. (over eat*).mp

105. overfeed*.mp

106. (over feed*).mp

107. exp Overnutrition OR overnutruition.mp

108. adipose.mp

109. exp Adipose Tissue

110. (fat * adj3 content).mp

111. (fat * adj3 distribut*).mp

112. cholesterol adj3 blood

113. glucose adj3 blood

114. 44 OR 45 OR 46 OR 47 OR 48 OR 49 OR 50 OR 51 OR 52 OR 53 OR 54 OR 55 OR 56 OR 57 OR 58 OR 59 OR 60 OR 61 OR 62 OR 63 OR 64 OR 65 OR 66 OR 67 OR 68 OR 69 OR 70 OR 71 OR 72 OR 73 OR 74 OR 75 OR 76 OR 77 OR 78 OR 79 OR 80 OR 81 OR 82 OR 83 OR 84 OR 85 OR 86 OR 87 OR 88 OR 89 OR 90 OR 91 OR 92 OR 93 OR 94 OR 95 OR 96 OR 97 OR 98 OR 99 OR 100 OR 101 OR 102 OR 103 OR 104 OR 105 OR 106 OR 107 OR 108 OR 109 OR 110 OR 111 OR 112 OR 113

115. exp Alcohol Drinking/

116. alcohol*.mp.

117. alcohol reduction.mp.

118. alcohol therapy.mp.

119. Alcohol intervention*.mp.

120. (alcohol* adj1 use*).mp.

121. (alcohol* adj1 abuse*).mp.

122. (alcohol* ad1 misuse*).mp.

123. (binge* adj1 drink*).mp.

124. (alcohol* adj1 problems*).mp.

125. binge drink*.mp.

126. alcohol use*.mp.

127. alcohol abuse*.mp.

128. alcohol misuse*.mp.

129. 115 OR 116 OR 117 OR 118 OR 119 OR 120 OR 121 OR 122 OR 123 OR 124 OR 125 OR 126 OR 127 OR 128

130. 14 OR 43 OR 114 OR 129

131. Incentive*.mp

132. exp Motivation

133. exp Reimbursement, Incentive

134. (financial adj3 incentive*).mp

135. (pay* adj3 incentive*).mp

136. (cash adj3 incentive*).mp

137. (money adj3 incentive*).mp

138. (monetary adj3 incentive*).mp

139. (economic adj3 incentive*).mp

140. exp Reward OR reward*

141. pay*

142. prize*.mp

143. award*.mp

144. cash.mp

145. money.mp

146. monetary.mp

147. (cash adj3 pay*).mp

148. (cash adj3 transfer*).mp

149. (contingen* adj3 contract*.mp)

150. exp Token Economy

151. token*.mp

152. (token adj1 economy).mp

153. raffle*.mp

154. (contingen* adj3 manag*).mp

155. (contingent* adj3 contract*)

156. lotter*.mp

157. coupon*.mp

158. voucher*.mp

159. gift*.mp

160. motivat*.mp

161. reinforce*.mp

162. punish*.mp

163. exp Punishment

164. penalt*

165. competition*.mp

166. contest*.mp

167.bonus*

168. (contingen* adj3 pay*).mp

169. deposit*

170. (deposit* adj3 contract*).mp

171. disincentive*.mp

172. endowment*.mp

173. (cash adj3 contingen*).mp

174. (pay* adj3 contingen*)

175. 131 OR 132 OE 133 OE 134 OR 135 OR 136 OR 137 OR 138 OR 139 OR 140 OR 141 OR 142 OR 143 OR 144 OR 145 OR 146 OR 147 OR 148 OR 149 OR 150 OR 151 OR 152 OR 153 OR 154 OR 155 OR 156 OR 157 OR 158 OR 159 OR 160 OR 161 OR 162 OR 163 OR 164 OR 165 OR 166 OR 167 OR 168 OR 169 OR 170 OR 172 OR 173 OR 174

176. randomi?ed controlled trial.pt

177. controlled clinical trial.pt.

178. randomi?ed.ab.

179. placebo.ab.

180. drug therapy.fs.

181. randomly.ab.

182. trial.ab.

183.groups.ab

184. 176 OR 177 OR 178 OR 179 OR 180 OR 181 OR 182 OR 183

185. 130 AND 175 AND 184

Results limited to Humans and All Adults (19+)

Appendix 4.2: Studies included in review

1. Bloch, M. J., Armstrong, D. S., Dettling, L., Hardy, A., Caterino, K., & Barrie, S. (2006). Partners in lowering cholesterol: Comparison of a multidisciplinary educational program, monetary incentives, or usual care in the treatment of dyslipidemia identified among employees. *Journal of Occupational & Environmental Medicine, 48*, 675-681.

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3. Donatelle RJ, Prows SL, Champeau D, Hudson D (2000) Randomised controlled trial using social support and financial incentives for high risk pregnant smokers: Significant Other Support (SOS) program. *Tobacco Control*, 9(Supplement III):iii67–iii69.

4. Donatelle, R. J., S. L. Prows, et al. (2000) Using social support, biochemical feedback, and incentives to motivate smoking cessation during pregnancy: comparison of three intervention trials. American Public Health Association Meeting, Boston MA .

5. Donatelle, R. J. and D. Hudson (2002) Using 5 A's and incentives to promote prenatal smoking cessation. National Conference of Tobacco or Health; 2002 November 19-21; San Francisco, California, USA.

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- Glasgow, R. E., J. F. Hollis, et al. (1990) Employee and organizational factors associated with participation in an incentive-based worksite smoking cessation program. *Journal of Behavioral Medicine*, 403-418.

- Glasgow, R. E., J. F. Hollis, et al. (1991) Implementing a year-long worksite-based incentive program for smoking cessation. *American Journal of Health Promotion,* 192-199.

11. Gomel, M., B. Oldenburg, et al. (1993) Work-site cardiovascular risk reduction: a randomised trial of health risk assessment, education, counselling and incentives. *American Journal of Public Health*, 83, 1231-1238.

- Gomel, M. K., B. Oldenburg, et al. (1997). "Composite cardiovascular risk outcomes of a work-site intervention trial." *American Journal of Public Health* 87(4), 673-676.

12. Heil, S. H., S. T. Higgins, et al. (2008) Effects of voucher-based incentives on abstinence from cigarette smoking and fetal growth among pregnant women. *Addiction,* 103(6), 1009-1018.

- Heil, S. H., S. T. Higgins, et al. (2007) Voucher-based incentives for abstinence from cigarette smoking in pregnant and postpartum women. Society for Research on Nicotine and Tobacco 13th Annual Meeting; 2007 Feb 21-24; Austin, Texas 25, Abstract no: PA26-21.
- Higgins, S. T., I. M. Bernstein, et al. (2010) Effects of smoking cessation with voucher-based contingency management on birth outcomes. *Addiction* 105(11) 2023-2030.
- Higgins, S. T., S. H. Heil, et al. (2006) Smoking status in the initial weeks of quitting as a predictor of smoking-cessation outcomes in pregnant women. *Drug and Alcohol Dependence,* 85, 138-141.

13. Hennrikus, D. J., R. W. Jeffery, et al. (2002) RESEARCH AND PRACTICE-The SUCCESS Project: The Effect of Program Format and Incentives on Participation and Cessation in Worksite Smoking Cessation Programs. *American Journal of Public Health*, 92, 274-279.

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- Higgins, S. T., I. M. Bernstein, et al. (2010) Effects of smoking cessation with voucher-based contingency management on birth outcomes. *Addiction* 105(11) 2023-2030.

15. Higgins et al (unpublished) (reported Higgins 2012).

- Higgins et al (2012). Financial incentives for smoking cessation among pregnant and newly postpartum women *Preventive Medicine* 55 (2012) S33–S40.

16. Hunter, R (2011) Can we *nudge* the population to be more physically active? A randomised controlled trial'. Presentation at UKSB Annual Society Meeting, Stirling, December 2011.

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19. Jeffery, R. W. and et al. (1984). "Effectiveness of monetary contracts with two repayment schedules of weight reduction in men and women from self-referred and population samples." *Behavior Therapy* 15(3), 273-279.

20. Jeffery, R. W., W. L. Hellerstedt, et al. (1990). "Correspondence programs for smoking cessation and weight control: A comparison of two strategies in the Minnesota Heart Health Program." *Health Psychology* 9(5), 585-598.

21. Jeffery, R. W., R. R. Wing, et al. (1993) Strengthening behavioral interventions for weight loss: a randomized trial of food provision and monetary incentives. *Journal of Consulting and Clinical Psychology*, 61, 1038-1045.

- Jeffery, R. W. and R. R. Wing (1995). Long-term effects of interventions for weight loss using food provision and monetary incentives.*Journal of Consulting & Clinical Psychology* 63(5), 793-796.

22. Jeffery, R. W., R. R. Wing, et al. (1998) Use of personal trainers and financial incentives to increase exercise in a behavioral weight-loss program. *Journal of Consulting and Clinical Psychology*, 66, 777-783.

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33. Tevyaw, T. O., S. M. Colby, et al. (2009) Contingency management and motivational enhancement: a randomized clinical trial for college student smokers. *Nicotine & tobacco research*, 11, 739-749.

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Appendix 4.3: Characteristics of included studies

Study; Design	Country; Setting	Participants	Depriv level	Conditions	Incentive	Outcomes	Sustainment of changes	Notes
Smoking cessation								
Crowley 1995 RCT	USA; COPD clinic	49 smokers with diagnosis of COPD	High	All participants received a brochure + nicotine gum + CO monitoring over 86 days. They were encouraged to throw cigarettes down toilet. All were given 1 lottery ticket/ day for 'time and effort'. 3 groups: **1.Exp Group:** Rewarded with lottery tickets for every CO test < 10 ppm. **2. CSR Group:** rewarded with lottery tickets for each self-report of abstinence since last visit. **3 Control Group:** each control was paired with an exp participant and received the same reward as exp 'partner'	High value; uncertain	Mean CO levels and cigarettes smoked per day at 6 months Validation: expired CO (cut off 10ppm), urinary cotinine, finger pulse oximetry for blood oxygen saturation	Assessed. Incentives scheme duration was 65 days and the final assessment was at 6 months	CSR group excluded from analyses -it assesses the impact of a variable not evaluated by the review
Donatelle 2000a RCT	USA; prenatal clinics of WIC program.	220 pregnant smokers, WIC eligible	High	2 groups: **1. Best Practice As** (ask, advice, assess, assist, arrange) which included information on the importance of quitting smoking during pregnancy and tailored smoking cessation kit. **2. Best Practice As+ $50/month voucher** + opportunity to choose supporting partner who also received vouchers.	High value; certain	Smoking cessation at 8 months gestation and 2 months post-partum. Validation: salivary cotinine /<30ng/ml; salivary thiocyanate monthly /<100mg/ml	Not assessed. Incentives removed at final assessment (8 months)	
Donatelle 2000b RCT	USA; prenatal clinics of WIC	186 pregnant smokers recruited from	High	3 groups: **1. Best Practice As** (ask, advice, assess, assist, arrange) which included	Low value; certain	Smoking cessation at 8 months gestation.	Not assessed. Incentives removed at final	Best Practice 5 A's plus $25/month

	program	prenatal clinics from 8 Oregon WIC program counties		information on importance of quitting smoking during pregnancy and tailored smoking cessation kit. **2. Best Practice 5 A's + $25/month voucher** for biochemically confirmed cessation +opportunity to select a partner to support them (supporter did not receive incentives). 3**. Best Practice 5 A's plus $25/month voucher for biochemically confirmed cessation** + **biochemical feedback of potential harm to baby** + select a partner to support them		Validation: salivary cotinine /<30ng/ml; CO/<5ppm	assessment (6 months)	voucher + biochemical feedback of potential harm group excluded from analyses - not an appropriate control
Donatelle 2002 RCT	USA; prenatal clinics of WIC program	592 pregnant smokers recruited from prenatal clinics participating in WIC program	High	3 groups: **1. Best Practice As** support (ask, advice, assess, assist, arrange)which included information on importance of quitting smoking during pregnancy and tailored smoking cessation kit. **2.Best Practice 5 A's plus $25/month voucher** for biochemically confirmed cessation **3. Best Practice 5 A's plus $75/month voucher** for biochemically confirmed cessation	Group 2: Low value; certain Group 3: High value; certain	Smoking cessation at 8 months gestation, 2 months post-partum and 6 months post-partum Validation: via salivary cotinine /<30ng/ml; salivary thiocyanate monthly /<100mg/ml at	Assessed. Incentives removed at 8 months gestation (scheme duration 6 months) and final assessment was at 6-months post-partum	**Data provided by author upon request** Study includes two incentivized groups differing in a key potential effect modifier (i.e. value) Figures in the control group were divided by 2 to derive to 2 comparisons, each added to the analyses as if from independent studies.
Gallagher 2007 RCT	USA; psychiatric facilities	180 mental health patients who smoked.	High	3groups: **1. CR:** Weekly visits on wks (1-4 Phase I), fortnightly on wks 6-12 (Phase II) monthly on wks 16-24 (Phase III). Payments of $20 per abstinent visit in Phase I, $40 in Phase II, $60 in Phase	High value; certain	Smoking cessation at 20 weeks and 36 weeks. Validation: Verified by expired CO <	Not assessed. Incentives removed at final assessment (9 months)	The CR +NRT group excluded from analyses- not appropriate control

				III, and $80 if abstinent at 36wk follow up. **2.CR+NRT:** As CR Group, + 16-wk course of 21mg NRTpatches, + supporting instructions. **3. Control:** Visits at baseline and wks 20 and 36, +encouraged use of community smoker helpline and self-help information.		10ppm and by salivary cotinine <15ng/mL.		
Gine, 2010 Cluster-RCT	Philippines; Community	2000 members of the general public who smoked, approached by Green bank representatives on the street and asked to participate Randomization was at the area level	High	All participants received an information pamphlet on the dangers of smoking and a tip sheet on how to quit. 4.groups: **1. CARESw/ deposit:** financial commitment in form of savings balances and a non-financial commitment to be visited by a deposit collector (social pressure).Smokers encouraged to deposit their cigarette money every wk for 6 months, which was forfeited if failed smoking test. Participants received 30 pesos for taking 12 month test **2. CARES w/out deposit :** As above but without the deposit element (group dropped) **3. Cue cards** **4. Control:** Participants offered 30 pesos for taking 6 month test + 30 for 12 month test.	High value; certain	Smoking cessation at 6 months and 12 months Validation: urine cotinine equal to zero	Assessed. Incentives scheme duration was 6 months and final assessment was at 12 months	The authors dropped the CARES w/out deposit group due to low uptake and the Cue cards is excluded from analyses because an appropriate control
Glasgow 1993 Cluster-RCT	USA; workplace	18 worksites recruited from pre-specified areas including 1097 employee smokers	Other	2 groups: **1. Incentive:** Participants were eligible to receive monthly incentives ($120) for a year and if abstinent entered into monthly worksite lottery and annual sweepstake. Personnel offered support and encouragement but no quitting advice and support. **2. Non-Incentive:** Participants	High value; certain and uncertain	Smoking cessation at 1 year and 2 years. Validation: CO below 9ppm and salivary cotinine below 15ng/ml	Assessed. Incentives scheme duration was 1 year and last assessment was at 2 years	

				completed baseline and follow up surveys at 1 year and 2 years follow-up				
Gomel 1993 Cluster-RCT	Australia; workplace	28 ambulance stations involving 219 smokers.	Other	4 groups: **1. HRA:** risk factor profile feedback **2. RFE**: as above +advice, brochure, videos **3. BC:** as group 2 +individual counselling+ life-style change manual **4. BCI:** as group 3 +incentives, i.e. 2 lottery draws for A$40 over 10wk period, + 5 draw tickets for 1wk cessation; At 3m A$40 voucher for achieved targets. Station achieving highest % of participants meeting 6m goals won A$1000.	High value; certain and uncertain	Continuous smoking cessation; Change in BMI; Change in % of bay fat; Mean cholesterol changes; Change in aerobic capacity at 6 month and 12 months. Validation with blood tests (for smoking cessation blood cotinine was calculated with cut of 100), weight and height measurements; skin fold thickness measurements with clippers; Max oxygen consumption	Assessed. Incentives scheme duration was 6 months and last assessment was at 12 months	Full data available only for smoking cessation. Data related to other outcomes were excluded from the analysis. HRA and RFE groups excluded from analyses- not appropriate controls
Heil 2008 RCT	USA; prenatal clinic of WIC program	82 pregnant smokers recruited from one of four local large group obstetric practices and the WIC program	High	All participants chose quit date, and reported daily to clinic for CO monitoring for 5 days, then urine cotinine monitoring twice wkly for 7 wks, wkly for 4 wks, and then every 2 weeks for remainder of pregnancy. Post-partum monitoring increased to once/wk for initial 4 wks, and then biwkly for next 8 wks, with abstinence monitoring ending at end of wk 12.Vouchers escalating in value given for smoking cessation. Non-cessation reset vouchers back the original value but 2 consecutive negative tests restored value to pre-reset value.	High value; certain	Smoking cessation at end of pregnancy, 12 weeks post-partum and 24 weeks post-partum. Validation: confirmation of abstinence was with CO /< 6ppm for the first 5 days and then with urine-cotinine levels /<80 ng/ml	Assessed. Incentives removed at 12 weeks post-partum (scheme duration 8 months) and last assessment was at 24 weeks post-partum	

				Participants also received routine advice from clinic. 2 groups: **1.Contingent voucher group:** participants received vouchers for cessation beginning at US$6.25 and escalated by US$1.25 to a max of US$45.00. +ve test results reset voucher back to original value **2. Non-contingent voucher group:** Participants received voucher independent of smoking status. US$15.00 per antenatal visit and US$20.00 per postpartum visit				
Hennrikus 2002 Cluster -RCT	USA; workplace	2402 smokers recruited from 24 worksites.	Other	3 groups: **1. Group:** 13 group sessions over 2months **2. Phone:** sent printed materials+ 3-6 telephone counselling sessions **3. Choice:** free choice between group or phone program. Half sites in each intervention were offered direct incentives for participation and quitting: Quitters at 1month won $20 and entered lottery for grand prize drawn about every 6months	High; uncertain	Smoking cessation at 12 months and 24 months. Validation: self-report, countersigned by friend or family member for monthly abstinence. Grand draw prize winners + 24 month random sample of quitters tested for salivary cotinine	Assessed. Incentives scheme duration was 18 months and last assessment was at 24 months	Two levels of incentives were crossed with 3 program formats: groups sessions, telephone sessions or a choice, leading to 6 possible groups. For the analyses, groups of different format were combined to assess the effect of incentive vs. no incentive
Higgins 2004 RCT	USA; prenatal clinics	58 pregnant smokers recruited from one of three large group local obstetric practices or one	High	Same as Heil 2008	High value; certain	Smoking cessation at 36 weeks gestation, 12 weeks post-partum and 24 weeks post-partum Validation:	Assessed, Incentives were removed at 12 weeks post-partum (duration 9.5 months) and last	

		single-practitioner obstetric practice				confirmation of abstinence was with CO /< 6ppm for the first 5 days and then with urine-cotinine levels /<80 ng/ml	assessment was at 24 weeks post-partum	
Higgins unpublished (mentioned in Higgins 2012) RCT	USA; prenatal clinics	48 pregnant smokers recruited from local obstetric practices and WIC program.	High	Same as Heil 2008	High value; certain	Smoking cessation at 36 weeks gestation, 12 weeks post-partum and 24 weeks post-partum. Validation: confirmation of abstinence was with CO /< 6ppm for the first 5 days and then with urine-cotinine levels /<80 ng/ml	Assessed, Incentives were removed at 12 weeks post-partum (duration 9.5 months) and last assessment was at 24 weeks post-partum	
Jason 1997 Cluster-RCT	USA; workplace	844 employee smokers recruited from 63 worksites	Other	3 groups: **1. Self-help group:** 5-day cessation TV program 'Smoke-free in the 90s'+ 8-page newspaper supplement, self-help **2. Incentives group**: as group 1+ $1/day for each day abstinent up to 6months (maximum $175) **3. Support group:** as group 2 +group meetings twice/week for first 3wks, +14 'booster' meetings over 6months; program included 'buddy' system, and tips in booster sessions on living with a smoker, weight control, exercise and stress management	Low value; certain	Smoking cessation at 6 months, 12 months, 18 months and 24 months. Validation: confirmation of abstinence was with CO < 9ppm and for the 6 month assessment saliva cotinine (cut of point not mentioned) was also used	Assessed. Incentive scheme duration was 6 months and last assessment was at 2 years.	The Support group assessed the effect of group support and cognitive coping skills on smoking cessation and is excluded from the analyses
Jeffery 1990 (A) RCT	USA; Community	1304 participants from 31400 households	Other	2 groups: **1. Newsletter:** Participants were posted self-help manuals for smoking cessation and 6 newsletters (one a month)	Low value; certain	Smoking cessation at 6 months; Validation: Participants	Not assessed. Incentives removed at final assessment (6	

		recruited via direct mail.		providing advice on behaviour change strategies. They were also requested to pay $5 registration fee **2. Newsletter and incentive:** As above but participants did not pay registration fee but were requested to deposit $60, 1/6 of which would be refunded each month they were abstinent. Full refunds given to those achieving at least 4 month cumulative abstinence or abstinence in last month of program.		reporting being abstinent at the end of the study were required to come in for validation with salivary cotinine less than 11 ng/ml	months)	
Klesges 1987 Cluster-RCT	USA; workplace	136 employees from 8 worksites recruited via posters, pamphlets and in-house memos announcing a smoking program at their worksite;	Other	3 groups: **1. Basic Program** 6 wkly CBT group sessions, aimed at brand-switching+reduction, aiming for final quitting or reduced % of each cig smoked. Also info on maintenance and relapse prevention **2. Competition:** As 1, + within-site team competitions. Wkly feedback on team performance, smoking 'barometer', prizes for completing treatment (~ $5 per team member), for team with highest number of quitters at end (~ $10 per member), and for highest abstinence at 6m follow up (~ $15 per member). **3. Relapse prevention:** After 6 wks intervention worksites were randomized to relapse prevention or no relapse prevention resulting in 4 groups to be assessed at the 6 month follow-up As 1, +/- Comp, +/- 1- or 2-monthly meetings to discuss, role-play, quit again, develop RP skills.	Low value; certain	Smoking cessation at 6 months; Validation: CO < 10 ppm and SCN at baseline. CO preferred to SCN at 6m follow up.	Not assessed. Incentives removed at final assessment (6 months)	Relapse prevention vs. no relapse prevention groups were collapsed for the analyses to assess the effect of incentive vs. no incentive at 6 months
Rand 1989 RCT	USA; workplace	51 smokers employed at a medical centre recruited with	High	3 groups: **1. Contingent payment/frequent monitoring:** Participants attended initial 15min lecture on strategies for	Low value; certain	Smoking cessation at 6 months; validation: CO	Not assessed. Incentives removed at final assessment (6	Non contingent payment/frequent monitoring group was the

		poster adds and word of mouth		smoking cessation+were given a booklet. Were told to stop smoking the following Sunday in preparation for Monday morning start of monitored abstinence period (5 days) when participants were visited at worksites for collection of breath samples. Were also required to visit study site to give afternoon sample+were visited at home for collection of evening samples. They received $25 for completion of this phase. Successful abstainers were visited at worksites twice/for breath samples+were paid $4 for each CO value less than 11ppm. **2. Non-contingent payment/frequent monitoring:** As above but participants paid $4 regardless of CO values **3. Non/contingent payment infrequent monitoring:** As above but participants were monitored only at 6 months		reading equal or below 11ppm	months)	most appropriate comparison. Therefore the non-contingent/infrequent monitoring group was excluded from the analyses
Shoptaw 2002 RCT	USA; Methadone maintenance clinic	175 drug addict smokers were identified through flyers and counsellor nominations	High	4 groups: **1. Patch:** For duration of the 12 weeks prog participants received two or three nicotine patches with max of 84 patches. Participants provided breath +urine samples 3 times/wk **2. Patch & CM:** As above+participants were offered vouchers for smoking cessation, escalating in value with consecutive abstinent CO samples and reset in case of failure. **3. Patch & RP:**As 1+ participants received relapse prevention counselling: psycoeducational techniques to enhance coping with smoking cessation +behavioural skills to instil smoking abstinence+mood management	High value; certain	Smoking cessation at 6 months and 2 months; Validation: Self-report, CO level at or below 8ppm and urine cotinine below 30mg/ml	Assessed. Incentive scheme duration was 12 weeks and final assessment was at 12 months	Comparisons of interest: i) Patch vs. Cm ii) Patch & RP vs. Parch & RP & CM. Each entered into analyses as if from independent studies (dummy record generated)

				4. Patch& CM &RP: Participants received patch+ offered vouchers+ underwent relapse prevention				
Tevyaw 2009 RCT	USA; Universities	110 students smokers recruited from colleges and universities in a north-eastern U.S. state	Other	Four groups: **1.MET + CM:** Participants underwent motivational therapy+had 2 daily CO breath samples collected+received $5 for samples regardless of smoking status . During wk 1 they earned $1 for CO reduction 25%-49%; $2 for reduction 50%-74% and $3 for 75% reduction or greater. During wk 2 reinforcement given for abstinence in an escalating schedule beginning at $3 and increasing by $0.5 for each consecutive non-smoking sample+ received bonus of $1 for 2 consecutive non abstinent samples. Failure reset value to $3 which returned to original value after 4 consecutive abstinent samples. **2. MET + NR(no reinforcement):** Participants received motivational enhancement+had 2 daily CO breath samples collected+received $5 for samples regardless of smoking+bonus of $10 for attending at least 80% of the CO readiness for each wee. Total of $240 could be earned. **3. REL (muscle relaxation) +CM:** As MET & CM but instead of motivation therapy participants received muscle relaxation therapy **4. REL + NR:** Participants received muscle relaxation+gave 2 daily CO breath samples+received $5 for samples regardless of status+bonus of $10 for attending at least 80% of the CO readiness for each wee. Total of $240 could be earned.	Low value; certain	Smoking cessation at 6 months; Validation: CO reading /<5ppm and saliva cotinine <15ng/mL	Assessed. Incentive scheme duration was 3 weeks and final assessment was at 3 months	The 2 MET groups and the 2 REL were collapsed for the analysis to focus on CM vs. NR in line with the review by Cahill & Perera (2011)

Volpp 2006 RCT	USA; medical centre	176 smokers recruited from the waiting room of an outpatients' clinic;	High	2 groups: **1. Incentives:** Participants received invitation to enrol in smoking cessation prog+offered $20 to attend each of 5 sessions (total of $100) + $100 for self-reported quitting at 30 days+nicotine patches+$20 for adhering to validation procedures **2. No incentives:** Participants received invitation to enrol to smoking cessation prog. All enrolled received free nicotine patches+$20 for adhering to validation procedures	Low value; certain	Enrolment at smoking cessation program; attendance and completion of smoking cessation program; 7-day point prevalence smoking cessation at 6 months following program completion; Validation: urine cotinine (<500 ng/mL)	Assessed. Incentive scheme duration was 30 days and last assessment was at 6 months	
Volpp 2009 RCT	USA; workplace	878 smokers employees of a big company recruited through survey	Other	All participants received $20/ telephone interview at baseline and at 3months follow up+ $25/ confirmatory sample returned. 2 groups: **1. Incentive:** Participants received $100 for completion of smoking-cessation prog; $250 for smoking cessation confirmed with cotinine test within 6 months after study enrolment; $400 for continued abstinence 6 months after initial cessation (9 or 12 months after enrolment) **2. Control:** Participants in this group received information about smoking cessation programs without being offered financial incentives.	High value; certain	Prolonged abstinence at 9 or 12m. Those not abstinent at 3m were retested at 6m, and followed from then if abstinent. All abstinent at both follow ups were assessed again 6m later, i.e. at 15 or 18m. Validation: Cotinine by saliva 15 ng per ml or urine cotinine level of 2ng per ml	Assessed. Incentive scheme duration was 9 or 12 months and last assessment was at 15 or 18 months	9-12m endpoint used in 6m time-point, and 15-18m endpoint in 12m time-point, in line with Cahill & Perera's (2011) analyses.

Windsor 1988 RCT	USA; workplace	378 employees smokers informed about the smoking cessation program through announcement in company newspaper	Other	4 groups: **1.Control/self-help manual onl**y: Participants received self-help manual **2. Self-help manual &social support/skills training:** As 1+ received cessation skills training (diary, deep breathing), contract to quit+quit smoking 'buddy' (with buddy education). **3.Self- help manual& incentives:** As 1+ received an incentive 6 wks following cessation and another at end of 6 month cessation (total $50) **4.Self- help manual, social support/skills training&incentives:** As groups 1,2 and 3 combined	Low value; certain	Smoking cessation at 6 months and 12 months; Validation: SCN with a cut off of /<100mg/ml	Assessed. Incentive scheme duration was 6 months and last assessment was at 1 year	Comparisons of interest are i)Group 1 vs 3 ii) Group 2 vs 4. Each comparison entered into analyses as if from independent studies (dummy record generated)
Indicators of healthier eating and/or physical activity								
Bloch 2006 RCT	USA; workplace	171 adults attending an annual health screening program found to have high cholesterol.	Other	All participants received on-line educational materials 3groups: **Group 1** received $100 for reduction of LDL-C by 15% within 6 months **Group 2** received multi-disciplinary educational program (series of live classes and phone support delivered by a nurse educator) **Group 3** received no further intervention.	Low value; certain	Mean % change in LDL-C at 6 months compared to baseline; number of individuals in each group reaching target reduction of 15% in LDL-C at 6 months. Validation: fasting blood test	Not assessed. Incentives removed at final assessment (6 months)	Group 2 excluded from analyses -not an appropriate comparison group
Francisco 1994 RCT	USA; workplace	63 employees with elevated cholesterol, recruited from a health fair.	Other	All participants received health-related information at health fair 2 groups: **1.Experimental group:** offered $100 to reduce serum cholesterol by 20% or	Low value; uncertain	Mean change in serum cholesterol level at 6 months after pre-test; Validation:Non-	Not assessed. Incentives removed at final assessment (6 months)	Study excluded from analyses: outcome dispersion reported in the form of ranges,

				below 5.17mmoI.L (200mg/dL) **2. Control group:** not offered incentive to reduce serum cholesterol		fasting blood test		which are unstable for the estimation of standard errors (needed for the analyses).
Galbo 2011 Cluster-RCT	USA; workplace	73 overweight or obese employees working at 4 nursing homes	Other	2 groups: **2.Control:** Participants received booklet and had 1hr consultation with dietician and/or Health Educator-set weight loss goals (16lb or 24lb in 16 weeks depending on initial BMI). They were weighted at 16 weeks and 28 weeks. **2. Incentivized group:** Participants received above care + incentives for losing 11-14lb + could deposit money which could be earned back and matched if goals were met.	High value; certain	At 16 weeks: % participants losing weight At 28 weeks: Mean weight loss; % of participants showing improvement in BMI; **% participants losing weight (included in analyses)**;% of participants losing weight/maintaining weight loss	Not assessed. Incentives removed at final assessment (6 months)	
Jeffery 1983 RCT	USA; Community	89 overweight adults recruited from a population sample of men surveyed but found ineligible for a different trial	Other	All participants participated in 16 wk behavioural weight-reduction/education program. Weight loss goals were 30lb. Participants weighed wkly. 6 groups: **1.Group_$30:** Participants deposited $30 and were reimbursed based on average weight-loss of their groups **2.Group_$150:** As group 1 but participants deposited $150 **3.Group_$300:**As groups 1&2 but participants deposited $300 **4.Individual_$30:** As group1 but participants reimbursed based on own weight-loss at rate of $1/lb up to a max weight loss of 2lb/wk **5.Individual_$150:** As group 2 but	Low value; certain	Weight change at 6, 12 and 24 months	Assessed. Incentive scheme duration was 16 weeks and last assessment was at 1 year	Study excluded from analysis: the two incentivized groups did not differ on any key variables (classification of value and/or certainty of attainment) and there was no control group to which a possible combination of the two could be compared.

				participants were reimbursed based on own weight-loss at a rate of $5/lb up to a max weight loss of 2lb/ week. **6.Individual_$300:** As group 3 but participants reimbursed based on own weight-loss at a rate of $10/lb up to a max weight loss of 2lb/ week				
Jeffery 1984 RCT	USA; Community	115 adults half of which were recruited from a population sample of a previous study by Jeffery et al 1983 and the other half through newspaper advertisement.	Other	All participants took part in 16 wkly group meeting covering nutritional, exercise and behavioural principles. A $150 deposit was used to construct weight loss contracts. 3 groups: **1. Control:** deposit was refunded at first session **2. Contracts w/ constant refunds:** Participants either received $30 for each 5lb increment of average group weight loss (weight loss goal was 20l for women and 30lb for men) **3. Contract with increasing refunds:** participants received funds for successive 5lb increments of $5, £10, $20, $40 and $75. Individuals weight loss goals were 20lb for women and 30lb for men	Low value; certain	Mean change in body weight at 1 year	Assessed. Incentive scheme duration was 16 weeks and last assessment was at 1 year	The two financial incentive groups differed in a variable not assessed by the review and groups were collapsed for the analyses
Jeffery 1990 (B) RCT	USA; Community	142 individuals recruited from 31400 households recruited via direct mail.	Other	2 groups: **1. Newsletter:** Participants were posted self-help manuals for weight-loss and 6 newsletters (one a month) providing advice on behaviour change strategies. They were also requested to pay $5 registration fee and set a weight-loss goal of max 4lb/month (24lb in 6 months). **2. Newsletter and incentive:** As above but no registration fee requested. But participants deposited $60 to be	Low value; certain	Mean weight loss at 6 months; Validation: Weight loss was confirmed via self-report and a random sample was weighed	Not assessed. Incentives removed at final assessment (6 months)	Dummy record. Jeffery 1990 (A) and (B) are part of one study report reporting two incentive schemes; one for smoking cessation and one for weight loss

				refunded proportionate to their weight loss				
Jeffery 1993 RCT	USA; Community	202 overweight participants recruited from two urban communities through newspaper add, radio announcement and mailed invitation.	Other	five groups: **1.Control:** no intervention **2.SBT:** Participants provided with a standard behavioural treatment: counselling in groups meeting wkly for first 20 wks and once a month thereafter including wkly weigh-ins and individualised caloric daily goals and set weight loss goals (14 18 or 23 kg). Participants asked to record caloric intake in daily food record for first 20 wks and for 1 week each month thereafter. Exercise program also prescribed **3.SBT + food provision:** Same SBT but participants also received packaged meals for 5 breakfasts and five dinners each wk and meal plan **4.SBT + incentives:** As SBT but participants also received cash payment each wk based on weight loss. Max payment $25/wk ;min payment $2.5 if weight maintained. Weight-losses of 50% of goal paid with $12.50/wk **5. SBT+ food provision+incentives:** As SBT group, as well as packaged meals and incentives	High value; certain	Change in BMI; Change in weight; Changes in total calories consumed per day;% of calories from fat at 6 months; 12 months, 18 months and 30 months; Estimated energy expenditure from exercise, last week of 18 months	Assessed. Incentive scheme duration was 18 months and last assessment was at 30 months	Control group is excluded from analysis because it is not the most appropriate comparison for assessing the impact of incentives. Comparisons of interest are between: i) SBT vs. SBT+I ii) SBT+food provision vs. SBT+food provision +I. Comparisons added to analyses as if from independent studies (dummy record generated)
Jeffery 1998 RCT	USA; community	196 overweight participants recruited by media advertisement from 2 urban communities	Other	five groups: **1.SB:** Participants received behavioural intervention program for 18 months (group counselling, met wkly for 24 weeks and monthly thereafter). Sessions included weigh-ins and participants were given caloric goals and menus. They were asked to record their daily caloric and fat intake and instructed to exercise and were taught	High value; certain	Mean change in body weight and exercise behaviour at 6 month and 18 months: Validation: body weight measured with scales; exercise behaviour measured	Not assessed. Incentives removed at final assessment (18 months)	The SB group is excluded from analyses because it is an inappropriate control. Comparisons of interest: i) SBT plus supervised walks vs. SBT

				behavioural techniques. **2. SBT+ supervised walks:** As SB but participants also had 3 supervised walks/wk. **3. SBT+ supervised walks+ incentives**: As group 1 and 2 but participants received financial incentives based on number of sessions walked at end of each month, increasing in value with cumulative attendance. **4.SBT+ supervised walls w/ personal trainers:** As group 2 but personal trainer assigned to work with 3-4 participants, **5. SBT+SW+PT+I:** Received the treatment delivered to all groups		with Paffernbarger Physical Activity Questionnaire and number of walk session attended		with supervised walks plus incentives ii) SBT with supervised walls with personal trainers vs. SBT+SW+PT+I Comparisons added to analyses as if from independent studies (dummy record generated)
John 2011 RCT	USA; community	66 overweight participants identified through the Philadelphia Veterans Medical Center patient database	Other	3 groups: **1. Control:** Participants underwent a 1hr consultation with dietician at enrolment, in which strategies for weight loss were discussed, goal-setting and monthly weigh-ins. They were given weight loss target of 24lb for first 24 wks and could then chose goal for wks 24-32. Also given a scale to monitor weight at home and received $20 for returning to clinic to be weighed **2. Deposit contract- maintenance:** At the beginning of the program participants had a 1h consultation with dietician. Weight loss goal set at 24lb in 24 wks. At beginning of each month they deposited $0-$3/day of their funds. During the month they could accumulate rewards if each day they reported a weight at or below target weight-loss (their own deposit plus a 1:1 match) which they would receive if	High value; certain	Mean weight loss; proportion of individuals achieving target weight loss at 32 weeks from start of program and 36 weeks from end of program; participants achieving weight loss equivalent to 5% of initial body weight **(latter data included in analysis and given by authors upon request)** Validation: weight ins	Assessed, Incentive scheme duration was 32 weeks and final assessment was at 17 months	As the two incentive conditions differed in aspects other than the incentives offered they were collapsed for the analyses

				they weighed at or below target weight loss at the end of month (4 pounds). After 24 wks they received incentives for maintaining weight loss. Participants also encouraged to have daily weigh-ins and received daily text msgs with feedback on progress and earnings. **3. Deposit contract – opportunity for continued weight-loss:** As above but after 24 weeks people told that during the next phase they had opportunity to continue losing weight and earning incentives (they could lose 24 lb in 32 wks)				
Klem 1988 RCT	USA; community	59 overweight participants	Not known	3 groups: **1. Bibliography:** Participants given a self-help weight loss manual. Each wk for 12 wks they were weighed. **2. Competition:** Participants were assigned to two teams with cash prizes awarded to the team a) with highest participant rates ($5 per member) b) the highest % weight loss at 12 wks ($10 per member) and c) the best maintenance of weight loss at the 3 month follow-up ($20 per member) **3. Bibliography + competition:** As group 1 and 2	Low value; certain	Weight loss at 6 months and 9 months ; Validation: weight ins	Assessed. Incentive scheme duration was 6 months and last assessment was at 9 months	With Bibliography as the control the Bibliography+Competition group is a more appropriate comparison to estimate the effects of incentives. Therefore the Competition group was excluded from the analyses
Kramer 1986 RCT	USA; Community	139 overweight participants recruited through newspaper advertisement, worksites and ineligibles from	Other	All participants deposited $120 3 groups: **1. Incentives for weight maintenance:** Participants took part in program with non-specific format. Monthly sessions consisted of discussions about weight maintenance and related problems. Deposit was lost for each session not	Low value; certain	Change in weight; % of individuals maintaining lost weight at 1 year; Validation: weigh ins	Not assessed. Incentives removed at final assessment (12 months)	The skills training group is excluded from analyses because it is least comparable to the incentives

		other studies		attended + withheld (but returned in the end) if they weighed more than previous sessions **2. Incentives for participation in skills training:** Participants received parts of deposit for attending monthly group meetings which provided diet and physical activity information and skills training for maintaining weight loss **3. No treatment:** No intervention. $100 from deposit refunded immediately. Participants sent reminder letter at 6 months and followed at 1 year when they received the reminder $20				for weight maintenance group
Long 2012 RCT	USA; medical centre	118 African American participants aged 50 to 70 with persistently low diabetes control, treated at the Philadelphia VA Medical Center	Other	All patients were called the day after enrolment and notified of their starting HbA1c level as well as the American Diabetes Association and VA recommendations about HbA1c target levels. They were paid $25 for returning 6 months later for the follow-up. 3 groups: **1. Usual care:** received no further intervention **Peer mentoring:** Patients matched to a peer mentor (African American patients whose glucose control had previously been poor but was currently good) within 1 to 3 wks. **3. Financial incentives:** participants offered $100 at 6 months for 1% decrease HbA1c and $200 for 2% decrease.	Low value; certain	Change in HbA1c levels at 6 months. Validation: blood test	Not assessed. Incentives removed at final assessment (6 months)	Peer mentoring groups is excluded from analyses because as it is not an appropriate control
Mahoney 1974 RCT	USA; community	49 overweight participants recruited through newspaper	Not known	Four groups: **1.Self-reward for weight loss:** Participants deposited $35 and were fined $5 for missing group meetings. They received pamphlets describing	Low value; certain	Reduction quotient (Number of pounds lost divided by number of pounds overweight) at year	Assessed. Incentive scheme duration was 8 weeks and final	Study excluded from the analyses: data relating to assessments at a

		advertisement		stimulus control strategies for alteration of eating habits+weight charts & eating habits booklets for daily self-monitoring. During first 2 wks they recorded daily weight and eating habits +attended weight ins. During next 6 wks they received weight loss & habit improvement goals + were instructed to award themselves portions of their deposit for attainment of wkly goals **2.Self-reward for habit improvement:** As group 1 but participants were instructed to award themselves portions of their deposit for attainment of their weekly habit improvement goal **3. Self-monitoring:** As group 1 but during the subsequent 6 wks participants continued to monitor themselves and received weight loss and habit improvement goals after each weigh in. **6. Delayed control**		1	assessment at 1 year	minimum of 6-months from baseline were not reported. .
Norton 1980 RCT	USA; community	26 overweight participants recruited from a community of northern Utah	Not known	Three groups: **1.Commitment for study completion and behaviour change:** Participants took part in a 10 wk prog. 2 first wks were for self-monitoring and next 8 were for weight loss. Were weighed twice/ week +attended wkly group meeting where they received social reinforcement and education in stimulus control of eating behaviour. Treatment included self-monitoring of eating and exercise and related goal setting. Participants also made a $15 deposit returned for completing study & meeting goals. **2.Commitment for study completion:** As group 1 but participants deposited $15 retuned if they completed the study	Low value; certain	Behaviour changed in terms of eating and exercising; weight loss at 8 months; Validation: Behaviour change measured by self-report; weight loss measures at weight ins	Assessed, Incentive scheme duration was 10weeks and last assessment was at 8 months	Study is excluded from the analyses: data relating to assessments at a minimum of 6-months from baseline were not reported.

				3. No commitment				
Saccone 1978 RCT	USA; community	49 overweight participants recruited	Other	All participants except for those in the No treatment group received the basic stimulus control package 7 groups: **1.No treatment** **2.Program only – monitoring weight:** Participants told to monitor their weight daily **3.Program only – monitoring eating:** Participants told to monitor their eating behaviour daily **4.Program w/ reinforcement by therapist for weight loss:** participants told to monitor weight daily+ were weighed by therapist wkl.+deposited $30+received $1.50/lb lost up to $5 for last 6 wks **4.Program w/ reinforcement by therapist for eating behaviour change:** participants told to monitor eating behaviour daily at dinner meal with 9-point check-list+deposited $30+ received money for appropriate behaviour: 0-23 points no reinforcement; 24-33 point $1.75; 34-43 points $3.50, 44-53 points $4.50 & 54-63 point $5 **5.Program w/ reinforcement by sig other for weight loss:** As 4 but a significant other provided reinforcement **6. Program w/ reinforcement by sig other for eating behaviour change:** As 5 but a significant other provided reinforcement	Low value; certain	Change in weight at 1 year; Validation: weight-ins	Assessed. Incentive scheme duration was 9 weeks and final assessment was at 1 year.	Groups 4 and 6 were combined for the analyses and compared to 2 Groups 5 and 7 are combined for the analyses and compared to 3 The no treatment control as it is not an appropriate comparison to assess the effect of incentives and is excluded from the analyses The two comparisons of interested entered as if from independent studies (Dummy record generated)
Volpp 2008 RCT	USA; Health centre	57 overweight participants recruited through	Other	All participants received 1h consultation with dietician+were encouraged to have daily weigh-ins+received daily text messages giving	Group 1: High value; certain	Weight-loss after 7 months; Proportion of	Assessed. Incentive scheme duration was 16 weeks	Study includes two incentivized groups differing in a key

		mailings		feedback on progress and earnings. All participants received $20 for attending weigh-ins. 3 groups: **1. Deposit contract:** At beginning of each month participants contributed $0-$3/day of their funds to a deposit contract. During the month they could accumulate rewards if each day they reported a weight at or below their target weight-loss (their own deposit plus a 1:1 match+a $3 fixed payment) which they received if they weighed at or below their target weight loss at the end of month (4 pounds). Weight loss goal was 16 pounds in 16 wks. **2. Lottery:** Participants were eligible for daily lottery with expected value of $3/day if they reported a weight at or below their weight loss goal. Goal was 16 pounds in 16 weeks **3. Control:** Participants participated in weight monitoring prog involving monthly weigh-ins.	Group 2: High value; uncertain	participants achieving 5% weight-loss (data given by author) Validation: weigh ins	and last assessment was at 7 months	potential effect modifier (i.e. attainment certainty) Figures in the control group were divided by 2 to derive to 2 comparisons, which were added to the analysis as if from independent studies.
Wing 1981 RCT	USA; Community	40 overweight participants recruited through advertisement placed in local newspapers	Not known	Participants participated in 9 wkly +7 monthly meetings where they were weighed+participated in lecture-discussion of behavioural strategies for weight control+ were given daily caloric goal to produce 2lb/week weight- loss. Charts of eating&exercise were collected from participants wkly. 2 groups: **1. Payments for weight loss:** Participants brought 15 cheques for $15 to first meeting. One cheque was either returned or forfeited at each meeting. Cheques were returned at wkly intervals on an overall rate of weight loss of 2lb/wk. If cheques were	Low value; certain	Weight loss at 13 months	Assessed. Incentive scheme duration was 9 weeks and last assessment was at 13 months	Study excluded from analyses: a crossover method was employed in the delivery of incentives and there was no control group to which a possible combination of the two crossover treatment groups could be compared.

				forfeited 2 consecutive wks goals were adjusted. During maintenance phase (after first 8 weeks) cheques were returned for attendance. **2. Payments for attendance:** Participants brought 15 cheques for $15 to the first meeting. One cheque was either returned or forfeited at each meeting. The first 8 cheques were returned at wkly intervals for attendance and the last 7 for 2lb/week weight loss.				
Physical activity								
Hunter 2011 RCT	Northern Ireland; workplace	406 participants were recruited from Northern Ireland's main government offices	Other	2 groups: **1. Financial incentive:** Participants used Physical Activity Loyalty card to self-monitor physical activity levels. Mins of physical activity were converted to points, redeemed for rewards at week 6 and week 12. Participants received feedback via the PAL scheme website on mins of physical activity calories burned and distance covered. **2. No financial incentive:** as above but participants unable to collect 'points' or earn rewards/incentives.	Low value; certain	Difference in change in minutes of moderate-vigorous physical activity (mins/week) at 6 months. Validation: minutes of physical activity measured via Global Physical Activity Questionnaire	Assessed: Incentive scheme duration was 12 weeks and last assessment was at 6 months	**Data provided by author**
Jeffery 1998	See Jeffery 1998 under *Indicators of healthier eating and/or physical activity*							
Wing 1996 RCT	USA; community	37 participants were recruited by newspaper ads	Not known	2 groups: **1. Control:** Participants attended a standard behavioural weigh loss prog: meetings over 24 wks w/ weigh-ins+ educational lectures+supervised walk sessions **2. Monetary incentive:** As above but also participants earned prizes for exercise attendance ($50 gift certificate	High value; uncertain	Difference in % of exercise sessions attended by incentive vs. control groups; Proportion of exercise sessions attended and proportion of participants with	Not assessed. Incentives removed at final assessment (6 months).	Paper reports two studies. Study 1 is excluded (does not involve incentives) Study 2 is included

				drawing after attending each walk and $2000 travel certificate drawing after last session). +participated in wkly group meetings for 24 wks w/ weigh-ins +educational lectures.		good attendance at 24 weeks		

Appendix 4.4: Results of included studies

Study	Denominator	Timing of last assessment	Outcome	Results	Statistical significance	Other results	Comment
Smoking cessation							
Crowley 1995	I=18 C=15	6 months from intervention start (>3-6 months after incentive removal)	Mean CCO levels	I=20.4 (SEM=4.7) C=22.4 (SEM=4.2)	NS	Quite rate: n=5/36	CSR group (n=16) excluded from analyses with mean CCO 23.9 (+ 3.0), Groups collapsed at follow-up when reporting quite rate
Donatelle 2000a	I=103 C=102	>6-12 months from intervention start	Quit rate	I=21.4% C=5.9%	S		
Donatelle 2000b	I=67 C=60	6 months from intervention start	Quit rate	I=19.4% C=11.7%	Not reported		Unpublished study. Author contacted for data. Best Practice 5 A's plus $25/month voucher plus biochemical feedback of potential harm to baby (n=59) group excluded from analyses with reported quire rate 22%
Donatelle 2002	I(A)=192 I(B)=186 C=188	>12-18 months from intervention start (>6 months after incentive removal)	Quit rate	I(A)=5% I(B)= 7% C=3%	Not reported		Unpublished study. Author contacted for data
Gallagher 2007	I=60 C=60	>6-12 months from intervention start	Quit rate	I=7% C=5%	NS		CR+NRT (n=60) group not included in analyses with quit

							rate 2%
Gine, 2010	I=781 C=616	>6-12 months from intervention start (>3-6 months after incentive removal)	Quit rate	I=11% C=7%	S		Cue cards group (n=603) excluded from analyses with quit rate 2/603
Glasgow 1993	I=474 C=623	>18 months from intervention start (>6 months after incentive removal)	Quit rate	I=10% C=8%	NS	Incentives had a sig. effect on less educated participants (18.6% vs. 8.8%)	
Gomel 1993	I=30 C=30	>6-12 months from intervention start (>3-6 months after incentive removal)	Quit rate	I=3% C=10%	NS	Other outcomes: mean BMI change (sig. greater in HRA and RFE groups than for BC and BCI groups) mean change in % body fat (ns differences); mean change in aerobic capacity (ns differences); mean change in cholesterol (ns differences)	The health risk assessment (n=40) and risk factor education (n=28) groups were excluded. Quite rates were 5% and 6% respectively.
Heil 2008	I=37 C=40	>12-18 months from intervention start (>2-3 months after incentive removal)	Quit rate	I=8% C=3%	NS		
Hennrikus 2002	I=1264 C=1138	>18 months from intervention start (>6 months after incentive removal)	Quit rate	I=19.5% C= 19.7%	Not reported		Groups with different mode of delivery (telephone vs. group session) were combined for the analyses
Higgins 2004	I=30 C=23	>12-18 months from intervention	Quit rate	I=27% C=0%	S		

		start (>2-3 months after incentive removal)					
Higgins unpublished (mentioned in Higgins 2012)	I=21 C=20	>12-18 months from intervention start (>2-3 months after incentive removal)	Quit rate	I=5% C=0%	NS		
Jason 1997	I=281 C=280	>18 months from intervention start (>6 months after incentive removal)	Quit rate	I=13.2% C=10.3	NS		GIM group (n=283) with quit rate: 18.2% excluded from analyses
Jeffery 1990 (A)	I=9 C=133	6 months from intervention start	Quit rate	I=22% C=6%	Not reported		
Klesges 1987	I=66 C=61	6 months from intervention start	Quit rate	I=12% C=11.4%	Not reported		Relapse prevention vs no relapse prevention groups were collapsed for the analyses
Rand 1989	I=16 C=16	6 months from intervention start	Quit rate	I=6% C=6%	NS		Control group (n=14) with quit rate 0% excluded from analyses
Shoptaw 2002	I(A)=43 C(A)=43 I(B)=47 C(B)=42	>6-12 months from intervention start (>6 months after incentive removal)	Quit rate	I(A)=2.3% C(A)=9% I(B)=2% C(B)=4.8%	NS		Data provided by author
Tevyaw 2009	I=55 C=55	6 months from intervention start (>3-6 months after incentive removal)	Quit rate	I=2% C=5.5%	NS		Data extracted from Cahill & Perera 2011. Two CM groups and to NR groups collapsed for analyses
Volpp 2006	I=92 C=87	6 months from intervention start (>3-6 months after	Quit rate	I=6.5% C=4.6%	NS		

		incentive removal)					
Volpp 2009	I=436 C=442	>6-12 months from intervention start (>3-6 months after incentive removal)	Quit rate	I=9.4% C=3.6%	S	Incentivised participants had sig. higher rates of enrolment in smoking cessation course as well as completion rates	
Windsor 1988	I(A)=94 C(A)=95 I(B)=94 C(B)=94	>6-12 months from intervention start (>3-6 months after incentive removal)	Quit rate	I(A)=5.3% C(A)=6.3% I(B)=9.6% C(B)=18%	Not reported		
Indicators of healthier eating and/physical activity							
Bloch 2006	I=56 C=55	6 months from intervention start	Achievement of at least 15% reduction in LDL-C	I=37.5% C=14.5%	Not reported	LDL-C was reduced 17.9mg/dl (11%) in incentivised group and 5.5mg/dL (4) in control and this difference was significant	Dichotomous data extracted only and used in analyses. One intervention group excluded (nurse educator, n=60) which achieved a reduction of 17.9mg/dl (11%). 21 participants reached to goal of reducing LDL-C by at least 15%
Francisco 1994	I=13 C=18	6 months from intervention start	Mean change in serum cholesterol level	I=0.83mg/dL (1.21-21 mg/dL) C=0.68mg/dL (0.26-10 mg/dL)	S	The incentivised group showed 13.2% reduction in serum cholesterol levels; the control exhibited 11.3% reduction.	Data not included in analyses.

						Difference was significant.	
Galbo 2011	I=51 C=48	>6-12 months from intervention start	Number of participants losing at least 4lb	I=23 C=14	Not reported	Mean weight loss: I=-7.3 (sd=11.1); C=-2.1 (sd=8.3). Difference significant	Dichotomous data extracted only and used in analyses.
Jeffery 1983	I(a)=16 I(b)=15 I(c)=14	>18 months from intervention start (>6-12 months after incentive removal)	Mean weight loss	I(a)=-8.3 (sd=8.3) I(b)=-8.5 (sd=8.3) I(c)=-7.3	NS	Group conditions also included (n=17; n=14; n=13;) with mean weight changes -13.6; -15.8; -14.2 respectively	Data not included in analyses
Jeffery 1984	I=73 C=40	>6-12 months from intervention start (>6 months after incentive removal)	Mean weight loss	I=-6.43 (sd=7.73) C=-4.75 (sd=7.12)	Not reported		The two financial incentive groups (fixed amount vs increments) were collapsed for the analyses.
Jeffery 1990 (B)	I=105 C=106	6 months from intervention start	Mean weight loss	I=-9.49 (SEM=1.21) C=-4.56(SEM=1.43)	Not reported		
Jeffery 1993	I (A)=41 C(A)=40 I (B)=41 C(B)=40	>18 months from intervention start (>6 months after incentive removal)	Mean weight loss	I(A)=-1.75 (sd=6.41) C(A)= -3.2 (sd=6.82) I(B)= -1.75(sd=6.41) C(B)=-2.5 (sd=6.82)	NS		
Jeffery 1998	I(A)=37 C(A)=41 I(B)=36 C(B)=42	>12-18 months from intervention start	Mean weight loss	I(A)=-4.5 (SEM=1.2) C(A)=-3.8 (SEM=1.3) I(B)=-5.1(SEM=1.3) C(B)=-2.9 (SEM=1.1)	S		
John 2011	I=44 C=22	>12-18 months from intervention start (>6 months after incentive removal)	Proportion achieving 5% body weight weight loss	I=11.3% C=9%	Not reported	Mean weight loss; NS	Two incentive groups collapsed for analyses. Data provided by author
Klem 1988	I=19 C=19	>6-12 months from intervention start (>2-3 months after	Mean weight loss	I=-4.2 (sd=5.11) C=-0.58 (sd=1.41)	S		Completion group excluded from analyses. Mean

		incentive removal)					weight loss for group: -0.12, sd = 5.17
Kramer 1986	I=28 C=28	>6-12 months from intervention start	Proportion maintaining their post-treatment weight	I=32% C=17.8%	NS	Mean weight change: I= -17.7 (sd=18.0) C=- 18.8 (sd=15.5)	The skills training group (n=29) was excluded from analyses with 14% participants maintaining weight loss
Long 2012	I=40 C=39	6 months from intervention start	Mean change in HbA1c levels	I=-0.46 (CI95% -1.02-0.10) C= -0.01 (CI 95% -0.52-0.51)	NS		Peer mentor group (n=39) excluded from analyses. Mean change in HbA1c: -1.07% (95%CI, 1.84%-0.31%)
Mahoney 1974	I(a)=13 I(b)=11 C=14	>6-12 months from intervention start (>6 after incentive removal)	Reduction quotient; Number of lbs. lost	Not reported	NS		Data not included in analyses
Norton 1980	I=13 C=8	>6-12 months from intervention start (>6 after incentive removal)	Weight loss; Exercise and eating behaviour change	Not reported	NS		Data not included in analyses
Saccone 1978	I(A)=16 C(A)=6 I(B)=14 C(B)=8	>6-12 months from intervention start (>6 after incentive removal)	Mean weight loss	I(A)=-2.38 (sd=6.48) C(A)=-1.13 (sd=6.23) I(B)=-4.17 (sd=7.10) C(B)=-0.59 (ds=6.08)	Not reported		The no treatment control group was excluded from the analyses. Mean weight loss :+4 (sd=6.5).Reinforcements by therapist and reinforcement by sig. other groups were collapsed. The two programme only

							control groups were also collapsed.
Volpp 2008	I(A)= 19 I(B)=19 C=19	>6-12 months from intervention start (>2-3 months after incentive removal)	Proportion achieving 5% body weight weight loss	I(A)= 5.3% I(B)= 5.3% C=5.3%	Not reported	Mean weight loss; I(A)= -6.2 (CI95% −11.67- −0.81) I(B)= -9.2 (CI95% −15.89- −2.47) C=-4.40 (CI95% −9.19- 0.29) Differences NS	Data provided by author
Wing 1981	I(A)=18 I(B)=20	>6-12 months from intervention start (>6 after incentive removal)	Weight loss	I(A)=-20.30 I(B)=-10.95	NS		Data not included in analyses
Physical activity							
Hunter 2011	I=199 C=207	6 months from intervention start (>2-3 months after incentive removal)	Mean change in number of minutes of vigorous physical activity	I=3.04 (sd=298.15) C=-37.78 (sd=409.93)	NS		Data provided by author
Jeffery 1998	I(A)=37 C(A)=41 I(B)=36 C(B)=42	>12-18 months from intervention start	Mean change in number of calories spent through exercise (kcal/week)	I(A)=658(SEM=180) C(A)=338 (SEM=179) I(B)=664 (SEM=182) C(B)=595 (SEM=164)	NS	Number of walk sessions attended. I(A)=65.8 (SEM=8.8) C(A)=35 (SEM=8.4) I(B)=103.9 (SEM=9) C(B)=80.3 (SEM=8.3); significant differences	

Wing 1996	I=21 C=16	6 months from intervention start	Proportion with 'good' adherence to exercise sessions	I=71.4% C=56%	NS	Attendance to exercise sessions. I=60.7% of sessions C=52.2% of sessions. Differences NS	

Appendix 4.5: Multivariable analyses

	6 months from start		>6-12 months from start		>2-3 months from removal		>6 months from removal	
	OR (95% CI)	P-values	OR (95% CI)	P-values	OR (95% CI)	P-values	OR (95% CI)	P-values
Constant	1.73(0.88-3.40)	0.07	1.26(0.40-4.01)		-	-	0.86(0.29-2.55)	0.36
Behaviour Type								
Smoking cessation **vs.** Indicators healthier eating/PA	0.97(0.49-1.93)	0.93	1.12(0.38-3.28)	0.83	-	-	1.04(0.41-2.62)	0.92
Smoking cessation **vs.** Physical activity	0.68(0.26-1.73)	0.39	-	-	-	-	-	-
Attainment certainty								
Certain **vs.** Uncertain	0.55(0.11-2.81)	0.46	0.64(0.10-3.97)	0.61	-	-	1.15(0.38-3.50)	0.77
Certain **vs.** Certain and uncertain	0.58(0.09-3.77)	0.55	0.58(0.11-2.93)	0.48	-	-	1.07 (0.14-8.42)	0.94
Monetary value								
High **vs.** Low	0.77(0.46-1.29)	0.31	0.89(0.35-2.26)	0.80	-	-	1.48(0.61-3.56)	0.31
Level of deprivation								
Other **vs.** High	1.25(1.62-2.52)	0.51	2.31(0.68-7.85)	0.17	-	-	0.39(0.02-6.49)	0.43
Procedure standardisation bias								
Low **vs.** High	1.10(0.55-2.21)	0.78	1.05(0.47-2.35)	0.90	-	-	1.39(0.21-9.25)	0.67
Outcome measure reliability bias								
Low **vs.** High	1.33(0.63-2.84)	0.44	1.15(0.22-6.03)	0.86	-	-	-	-
Low **Vs.** Unclear	0.81(0.36-2.13)	0.76	0.65(0.16-2.59)	0.52	-	-	4.85(0.31-75.52)	0.20

Note: n denotes number of comparisons. Data relating to >2-3 months after incentive removal were subjected only to univariable meta-regression due to the small the number of comparisons

Appendix for Chapter 5

Appendix 5.1: Publication

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BMC Pregnancy & Childbirth

RESEARCH ARTICLE Open Access

The effectiveness of financial incentives for smoking cessation during pregnancy: is it from being paid or from the extra aid?

Eleni Mantzari, Florian Vogt and Theresa M Marteau*

Abstract

Background: Financial incentives appear to be effective in promoting smoking cessation in pregnancy. The mechanisms by which they might operate however, are poorly understood. The present study examines how financial incentives for smoking cessation during pregnancy may work, by exploring pregnant women's experiences of trying to stop smoking, within and outside of a financial incentives scheme.

Methods: Thirty-six (n = 36) UK-based pregnant smokers (n = 36), offered standard NHS Stop-Smoking Services, of whom twenty (n = 20) were enrolled in a financial incentives scheme for smoking cessation (n = 20) and sixteen (n = 16) were not, were interviewed about (i) their motivation to stop smoking, and (ii) the factors they perceived as influencing their quitting efforts. Framework Analysis was used to analyse the data.

Results: Women in the two groups reported similar reasons for wanting to stop smoking during pregnancy. However, they described dissimilar experiences of the Stop-Smoking Services, which they perceived to have differentially influenced their quit attempts. Women who were incentivised reported using the services more than women who were not incentivised. In addition, they described the motivating experience of being monitored and receiving feedback on their progress. Non-incentivised women reported problems receiving the appropriate Nicotine Replacement Therapy, which they described as having a detrimental effect on their quitting efforts.

Conclusion: Women participating in a financial incentives scheme to stop smoking reported greater engagement with the Stop-Smoking Services, from which they described receiving more help in quitting than women who were not part of the scheme. These results highlight the complexity of financial incentives schemes and the intricacies surrounding the ways in which they operate to affect smoking cessation. These might involve influencing individuals' motivation and self-regulation, changing engagement with and provision of support services, or a combination of these.

Background

Smoking during pregnancy is a major cause of infant morbidity and mortality [1] and contributes greatly to health inequalities [2]. It causes up to 4,000 deaths per year in the UK from miscarriages and stillbirths, and leads to increases in preterm births, low birth-weight babies [3,4], sudden infant death, asthma and attention deficit hyperactivity disorder [4,5]. Despite these adverse consequences, many women fail to quit while pregnant, with at least 17% of mothers in the UK smoking throughout their pregnancies in 2005 [6]. Reducing the incidence of smoking during pregnancy has therefore become an important focus of health policies in the UK and elsewhere.

Existing interventions have been relatively successful in promoting smoking cessation during pregnancy [7,8]. A recently updated systematic review [9] found the most effective of these to involve the use of financial incentives for stopping smoking (financial incentives vs. other interventions: OR 0.73, 95% CI 0.66 to 0.82). Findings were based on results from four trials conducted in the USA [10-13] and were confirmed by a further meta-analysis of three of these [14]. The mechanisms by which financial incentives operate to influence

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behaviour, including smoking cessation during pregnancy, are, however, poorly understood.

The effectiveness of financial incentives in achieving behaviour change, including smoking cessation during pregnancy, might result from direct influences to individuals' motivation and self-regulation. These influences potentially enable people to overcome the costs and barriers associated with initiating the target behaviour and move them past the "threshold" needed to act. Specifically, incentives might operate according to learning theory principles, by linking the target behaviour, in this case smoking cessation, to a positively evaluated stimulus, such as money, thus strengthening the value associated with the target behaviour [15]. Additionally they might work by influencing individuals' outcome expectations, i.e. their valuation of the likely consequences of a behaviour [16], or by facilitating allocation of limited cognitive capacity in such a way as to achieve the now more highly valued altered behaviour [15].

The effectiveness of financial incentive schemes in changing behaviour might also result from indirect influences, mediated by changes to some aspects of the process involved in their delivery. For example, the provision of incentives requires contact between health professionals, who measure achievement of the target behaviour, and patients [17]. Incentives might therefore operate by increasing health professionals' engagement with patients or through the additional involvement required on behalf of the latter, such as attending clinics or undergoing particular tests, as part of assessing eligibility for a reward. In addition, they might influence behaviour through the contract-agreement, which specifies the conditions of exchange between behaviour and money, encompassed in their use [17], given that behavioural contracts have been shown to improve patients' adherence to health care activities, even in the absence of the exchange of money [18]. It is also possible however, that the effectiveness of financial incentives in achieving behaviour change might also result from an interaction between direct influences to individuals' motivation and self-regulation and indirect influences mediated by changes so certain aspects involved in the process of incentive delivery.

Understanding the mechanisms by which financial incentives influence behaviour is key to determining how to maximize their effectiveness [19] and for designing optimal incentive schemes. Research is therefore needed to illuminate the processes involved in producing their beneficial effect for smoking cessation during pregnancy. Given the lack of knowledge regarding the factors that are operating when financial incentives schemes are used, qualitative research has an important contribution to make. The present qualitative study attempts to explore these factors by examining and comparing the stop-smoking experiences of pregnant women who were incentivised for smoking cessation and of pregnant smokers who were not incentivised for cessation.

Methods

Design

This is a comparative qualitative study, based on semi-structured interviews aiming to identify differences between the experiences of pregnant smokers who were incentivised for cessation and of those who were not.

Participants

Participants were thirty-six (n = 36) pregnant smokers, twenty (n = 20) of whom were receiving financial incentives for smoking cessation (incentivised group). The remaining sixteen (n = 16) were only offered NHS Stop-Smoking treatment[1] (control group). Participants were recruited through an opportunistic sampling frame involving a population of 115 pregnant smokers living in the greater Birmingham area (Figure 1) who were referred by their midwives to the NHS Stop-Smoking Services during the period September 2009 to May 2010 and:

i. were enrolled in a pilot scheme of incentivising smoking cessation run by the Birmingham East & North Primary Care Trust (BEN PCT), (in partnership with the

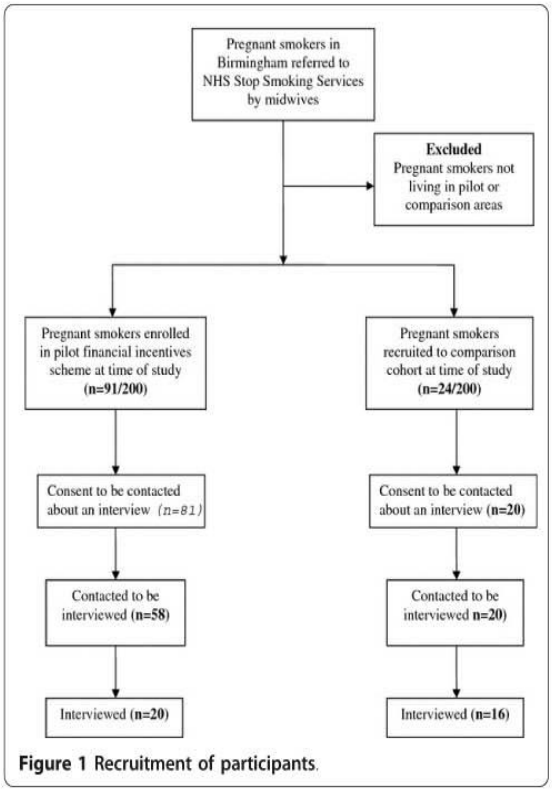

Figure 1 Recruitment of participants.

Young Foundation as part of the Healthy Incentives (HI) Partnership (http://www.healthyincentives.org.uk), or

ii. were eligible to be part of a comparison cohort, because they lived in areas selected as "comparison" areas.

Women enrolled in the financial incentives scheme were offered vouchers for quitting smoking. The offer of vouchers was dependent upon women's area of residence, i.e. whether they lived within the two pilot areas or not. Pilot areas were selected from the districts of Birmingham with the highest prevalence of smoking during pregnancy. The pilot financial incentive scheme aimed to enroll 200 pregnant smokers by the end of 2010 and to compare their smoking cessation rates against those of a comparison cohort of 200 women, recruited for evaluation purposes from parts of the PCT where financial incentives were not offered. Comparison areas were chosen by matching the pilot areas with two geographically similar districts with equivalent rates of smoking during pregnancy and comparable socio-economic composition. At the time the current study was conducted, 91 women were enrolled in the pilot financial incentives scheme, of whom 81 consented to be contacted for an interview. We aimed to recruit 20 of these women for the interview and achieved this with telephone calls to the first 58. Furthermore, 24 pregnant smokers had been recruited into the comparison cohort, of whom 20 consented to be contacted for an interview. All these women were contacted and 16 agreed to be interviewed.

Following the recommendations by Guest et al (2006) [20], as well as those by Kuzel (1992) [21] and Morse (1995) [22], this sample size was considered sufficient for achieving data saturation. Indeed, saturation of data for the themes of interest was achieved in both groups by the 15th interview, suggesting that the group sizes were sufficiently large to capture the range of women's smoking cessation experiences.

The mean age of participants in the incentivised group was 28 (range: 19-43). The mean age of participants in the control group was also 28 (range 17-39). The majority of participants were of White-British origin, with one woman in the control group being of Indian decent and another in the incentivised group originating from Hong-Kong. Although, minority ethnic groups constitute approximately one third of Birmingham city's population (with the Pakistani being the largest minority group followed by the Indian) [23], women from minority ethnic groups are less likely to smoke compared to the general population [24]. Compared to white women, they are also less likely to smoke during pregnancy [25] and are less likely to set quit dates with the stop smoking services [26]. The majority of women in both groups were of a lower socio-economic class, as indicated by their Index of Multiple Deprivation Scores (incentivised group: 42.35; control group: 42.51) which are above the average for Birmingham[2]. Most women in both groups were unemployed. Of those who were employed, most held skilled non-manual and semi-skilled manual jobs in fields such as social care, maintenance and cleaning, automobile mechanics and law reinforcement. At the time of the interview, six (n = 6) women in the incentivised group and five (n = 5) in the control group had already delivered their babies. Furthermore, one individual in the incentivised group had miscarried. With regards to their smoking status, eight (n = 8) women in the incentivised group and four (n = 4) in the control group were smoke-free at the time of the interview. The remaining 24 individuals were still smoking.

Procedure

Women in both groups were enrolled into the Stop-Smoking Services by the "Call to quit" call-centre (Birmingham's telephone line for information on local smoking cessation services). Women taking part in the financial incentives scheme for smoking cessation were asked by the call-centre's representative about their willingness to be contacted about the possibility of being interviewed about their experiences of quitting smoking. Women not taking part in the scheme were informed by a research midwife working for BEN PCT of the possibility of being interviewed. Women in both groups willing to be contacted about the study were approached by the interviewer (EM) via telephone. She informed them about the purpose of the research and enquired about their willingness to participate. At this point, all women were advised that they would receive £20 in cash to compensate for their time spent completing the study. A time and place [for a face-to-face interview] was arranged with those agreeing to be interviewed. The majority of participants chose to be interviewed in their homes, with one woman from the control group opting to be interviewed at her place of work. Ethical Approval for this study was granted by the NHS Birmingham, East, North and Solihull Research Ethics Committee, ref no 09/H1206/105.

Interviews

Interviews were semi-structured and followed an interview schedule to elicit information on women's experiences of smoking cessation. The schedule was piloted with five pregnant smokers attending prenatal appointments at a London hospital.

Interviews lasted an average of 23 minutes and were digitally recorded. Upon their completion, women were thanked and received £20 in cash to compensate for the time spent participating in the interview.

Data analysis

Anonymised interviews were transcribed verbatim and analysed using Framework Analysis [27] with the purpose of identifying and comparing the themes emerging in the accounts given by the two groups of women, with regards to i) their motivation for wanting to quit smoking, and ii) the factors they perceived as facilitating and inhibiting their quit attempts.

Framework Analysis was chosen because it provides a method of addressing specific research questions rather than for purely exploratory purposes. It consists of a matrix-based analytic method, which facilitates rigorous and transparent data management, such that all stages of analysis can be systematically conducted.

The analysis was conducted separately for each group of women. The resulting themes of interest where then tabled and compared to identify similarities and differences.

Results

The themes emerging in the accounts given by the two groups of women, with regards to i) their motivation for wanting to quit smoking, and ii) the factors they perceived as facilitating and inhibiting their quit attempts, are presented below.

Reasons for wanting to quit smoking during pregnancy

Women who were incentivised for smoking cessation and those who were not reported similar reasons for wanting to stop smoking during pregnancy, which were grouped under five themes: (i) Concern for baby, (ii) Feeling pressured, (iii) Financial issues, (iv) Concern for self and (v) Concern for existing children (Table 1).

The provision of *Financial incentives* emerged as a sub-theme of *Financial issues* in incentivised women's accounts of their motives for trying to quit:

> *"And then the vouchers give me incentive to, like, stop smoking" (Participant14, incentivised group)*

This however was not discussed as a primary reason and was often described as an "added bonus" for already wanting to quit:

> *"... the vouchers and the incentives and I thought well, that's even better. That, to me, was an added bonus that wasn't a reason quit, that was just like a reward for actually going to them." (Participant26, incentivised group)*

Factors perceived as influencing the quit attempt

Perceived facilitators

The factors that were perceived as facilitating cessation efforts by women in both groups were grouped under two themes: (i) Endogenous factors and (ii) Exogenous factors. Facilitators described as deriving from within the self were classified as Endogenous, while those described as deriving from the environment were classified as Exogenous. Similar Endogenous factors were described by women who had been incentivised for cessation and those who had not. These were grouped under three sub-themes: (i) Awareness of the consequences of smoking and quitting; (ii) Dispositional factors (positive mood, motivational strength and personality characteristics); and (iii) Low addiction (Table 2).

Women in both groups also described comparable Exogenous factors as facilitating their efforts, which were grouped under five sub-themes: (i) Availability of support; (ii) Lack of exposure to smoke; (ii) Lack of

Table 1 Reasons for wanting to quit smoking during pregnancy

Factor	Description	Incentivised Group	Non-Incentivised Group
Concern for Baby	Being pregnant and concerned about the possible consequences of smoking on the baby	✓	✓
Feeling pressured	**Internal Pressure**. Experiencing guilt for smoking while pregnant and feeling pressure from self not to do so	✓	✓
	External Pressure. Experiencing pressure from others not to smoke	✓	✓
Financial issues	**Expense of smoking**. Not affording to smoke and wanting to save money	✓	✓
	Financial Incentives. Wanting to get the vouchers	✓	*N/A*
Concern for self	Concern about the illnesses and physical damage (including damage to appearance) caused by smoking, about consequences on existing health problems (e.g. asthma) and wanting to increase energy levels	✓	✓
Concern for existing children	Being concerned about the consequences of smoking on the health of existing children, wanting to reduce the possibility of them becoming smokers because of exposure to smoking, and wanting to avoid causing children distress due to personal smoking-related health problems	✓	✓

Table 2 Factors perceived to facilitate smoking cessation attempt

Factor	Description	Incentivised Group	Non-Incentivised Group
Endogenous			
Awareness of the consequences of smoking & quitting	**On the baby's health**. Having knowledge or experience of the consequences of smoking on the unborn baby and thinking of potential harms	✓	✓
	On resources. Thinking that smoking leads to a waste of money and quitting efforts and experiencing the benefits of quitting on money and time	✓	✓
	On personal health. Thinking of the consequences of smoking on health and experiencing the physical benefits of quitting	✓	✓
Dispositional factors	**Personality**. Possessing traits associated with an increased ability to maintain focus and persist with efforts	✓	✓
	Motivational strength. Wanting to quit and being focused on quitting	✓	✓
	Mood. Being in a positive mood	✓	✓
Low addiction	**Lack of Cravings**. Not experiencing cravings for cigarettes and smoking	✓	✓
Exogenous			
Availability of support	*i)* Having friends, family and colleagues provide encouragement, praise, concurrent quitting, and prohibition of smoking or exposure to smoke	✓	✓
Lack of exposure to smoke	Lack of smoking in immediate environment and deliberately avoiding smoking situations	✓	✓
Lack opportunity to smoke	Decreased opportunities to smoke due to prohibition of smoking in certain places and around certain people, embarrassment of smoking in public, existence of health issues or preoccupation with other matters	✓	✓
Stop Smoking Services	**Receiving support& advice**. Being provided with support by speaking to smoking cessation counsellors and receiving information and advice	✓	✓
	NRT. Receiving NRT	✓	✓
	Receiving feedback. Getting feedback on progress, either verbally from members of the services, or by viewing improved CO levels	✓	×
	Being monitored. Having CO levels checked by the Stop-Smoking Services	✓	×
Financial incentives	Getting the vouchers	✓	*N/A*

opportunity to smoke; (iv) Stop Smoking Services; and (v) Financial incentives (Table 2). Their accounts differed, however, with regards to the dimensions that emerged in relation to one of the Exogenous factors, namely the Stop-Smoking Services. Although participants in both groups described the perceived beneficial effects of *Receiving support and advice* from the services and of the *Nicotine Replacement Therapy* that was provided by the services, incentivised women discussed the former more consistently and at a greater length than did non-incentivised women. Incentivised women additionally described the motivating experience of *Being monitored*:

"I think having that knowing that he was going to check what, what we were... the intake and stuff that was kind of the, the bit that was making me not want to smoke as well because it was like for the test..." (Participant02, incentivised group)

Specifically, women in this group described how having their carbon monoxide levels checked made them not want to smoke, out of the need to prove their abstinence:

"if I go to the chemist I have to prove to the pharmacist that I have cut down... it's a bigger goal" (Participant36, incentivised group)

This need appeared related to their fear of being judged for smoking during pregnancy:

"I knew that I'd got to go and check in, it's what, it's what that person would think of me I'm pregnant and I'm smoking and they'll going to know that I'm smoking. So it was that, having that support because I knew I'd have to face somebody. And I guess it was that being judged by..."(Participant26, incentivised group)

It also appeared to have arisen from their fear of being told off for not trying to quit:

"So I was constantly thinking about keeping my carbon monoxide levels down so I don't get into trouble... I thought it was like I keep smoking like my five/six a day then my carbon monoxide levels will either stay the same or go up a little bit. And it would be like, "You're

not trying to quit why should I bother with you because you're not even participating". Do you know what I mean?" (Participant20, incentivised group)

Furthermore, it appeared to be associated with women's desire to avoid disappointing the smoking cessation counsellors:

"... they was very good. And I think it was going to somewhere like that every week that you didn't want to go and say, "I smoked." ((laughs)) You know it helped you... You didn't want to feel like I'd let it down or yeah (Participant25, incentivised group)

Being monitored was closely related to the sub-theme *Receiving Feedback*, which was also perceived by incentivised women as having a beneficial effect on their smoking cessation efforts:

"For me to be tested and everything is good because and it kind of makes you feel good when it comes up like that and they're like "Oh well done."" (Participant30, incentivised group)

In fact, *Receiving Feedback* was described as a consequence of *Being Monitored*: witnessing improved carbon monoxide levels and/or receiving related praise from the smoking cessation counsellors was perceived to increase confidence and was thus perceived as facilitating efforts:

"It's just more of a moral support I think really and checking your carbon levels and once you realise you've done good, you know, it boosts your confidence to keep, keep not smoking, do you know what I mean?" (Participant32, incentivised group)

These differences in experiences may be related to the observation that women in the control group were less engaged with the services, regardless of the fact that access was equal across the two groups: Whereas all women in the incentivised group had used the Stop-Smoking Services at least once, some individuals in the control group had failed to attend even their first appointments:

"So have you used the services this time round?"(Interviewer)

"Not as yet - no" (Participant21, control group).

Had non-incentivised women used the services, their experiences might have been more similar to those of incentivised women, given that service delivery was meant to be identical across the two groups, with the exception of voucher provision. Indeed, when asked how being monitored each week would potentially influence her attempt to stop smoking, one woman in the control group who had not attended the services reported:

"No I think that sounds good... Because it's, it's actually assessing you isn't it? You're not going to want to turn up there say you've not stopped smoking.... I think that would help me.... Because it's putting a little bit of pressure on me, it's pushing me a little bit... Because you want to do it anyhow and I suppose like somebody watching you constantly that's what it's like isn't it? (Participant35, control group)

This differential engagement with the services seems related to the offer of *Financial Incentives* which appears to have motivated incentivised women to attend the services:

"I wouldn't have bothered going all the way to the doctors because at the beginning of your pregnancy and that you don't want to go out the house anyway because you're feeling sick and you're heavy and frumpy, and it just seems like a long way to go for nothing just to blow into a thing. With the vouchers it's like you're getting paid... rewarded to go there" (Participant14; incentivised group).

Indeed, the *Financial Incentives* were perceived as facilitating cessation attempts:

"the vouchers give me incentive to like stop smoking... So the vouchers have helped yeah because I'm thinking it's not that worth risking." (Participant14, incentivised group)

The vouchers appeared to have achieved this by providing a goal to work towards and a focus for resisting urges to smoke:

"I feel like I need another one [cigarette] I sort of sit there and think to myself well if I have this one it's going to mess me up getting my vouchers for my kids.... I won't because I'll just think well I've got the vouchers to look forward to" (Participant16, incentivised group)

An alternative explanation for the absence of the aforementioned sub-themes from the accounts of non-incentivised women is that whereas monitoring in the incentivised group was conducted routinely due to attainment of the vouchers being contingent upon the results of such monitoring, monitoring in the control group was inconsistent. This accords with the accounts of two women in the control group, one of whom was not monitored and another who exceptionally, was:

"They don't really monitor you... They only do it, they only did it the once" (Participant28, control group).

"I think that was the most useful thing and knowing that you were going back the following week and that it had to be good because there was a quantifiable way of seeing if you'd been sticking to the routine." (Participant13, control group; 28:20-23).

Perceived inhibitors

Similarly to the perceived facilitators, the factors that were perceived to inhibit cessation efforts, both by women who were incentivised and those who were not, were grouped under two themes: (i) Endogenous and (ii) Exogenous factors. Obstacles described as deriving from within the self were classified as Endogenous, while those described as deriving from the environment were classified as Exogenous. Similar Endogenous obstacles

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were described by women who had been incentivised for cessation and those who had not. These were grouped under four sub-themes: (i) Disregarding the consequences of smoking and quitting; (ii) Dispositional factors, (negative mood, lack of motivation strength and personality characteristics); (iii) Perceived benefits of smoking; and (iv) Addiction (Table 3).

Furthermore, women in both groups reported similar Exogenous factors as compromising their efforts, which were grouped under five sub-themes: (i) Lack of support; (ii) Exposure to smoke; (ii) Availability of cigarettes and opportunity to smoke; (iv) Stop Smoking Services; and (v) Financial incentives (Table 3). Their accounts, however, differed with regards to the sub-themes that emerged in relation to one of the Exogenous obstacles, namely the Stop Smoking Services.

Specifically, although participants in both groups described the perceived detrimental effects of the *Lack of Support and Advice* from the services and of the *Accessibility Issues*, non-incentivised women described the adverse effects of not receiving the appropriate Nicotine Replacement Therapy (NRT). This was perceived by women in this group as differentially affecting their cessation efforts and was mentioned as resulting from a lack of information on behalf of the services regarding the treatments allowed during pregnancy:

Table 3 Factors perceived to inhibit smoking cessation attempt

Factor	Description	Incentivised Group	Non-Incentivised Group
Endogenous			
Disregarding the consequences of smoking & quitting	**On the baby's health**. Discounting the harm of smoking because of having experienced disconfirming situations. Also discounting harm because of reduced cigarette consumption or because of inability to visualise baby and disregarding the benefits of quitting at advanced pregnancy stage	✓	✓
	On personal health. Blocking out personal health concerns and disregarding harms of smoking due to lack of relevant experience or by dissociating self from smokers with health problems	✓	✓
Dispositional factors	**Personality**. Possessing traits associated with a decreased ability to maintain focus and an increased likelihood of giving in to temptations	✓	✓
	Lack of motivation. Not really wanting to quit because of enjoying smoking or not considering quitting important	✓	✓
	Mood. Being in a negative mood	✓	✓
Perceived benefits of smoking	**To deal with stress**. Thinking that smoking helps with stress and using it to calm nerves down	✓	✓
	To deal with boredom. Smoking when bored	✓	✓
	To control weight. Thinking that smoking helps control weight and that quitting would result in weight-gain	✓	✓
	For social inclusion. Feeling left out when not smoking and using smoking for social inclusion	✓	✓
Addiction	**Habit & Associations**. Associating smoking with certain times of the day and being used to smoking in certain contexts	✓	✓
	Cravings. Experiencing cravings for cigarettes and smoking	✓	✓
Exogenous			
Lack of social support	Not receiving encouragement or praise, being told not to smoke and not having non-smoker peers to set example	✓	✓
Exposure to smoke	Being exposed to smoke in the immediate environment	✓	✓
Availability of cigarettes & opportunity to smoke	Smoking in situations that allow doing so, such as in the absence of certain people or when cigarettes are accessible	✓	✓
Stop Smoking Services	**Lack of Support& Advice**. Being judged, not being listen to, not being given sufficient explanations and advise, not being followed-up and lacking attention and individualised support	✓	✓
	NRT provision problems. Not receiving the appropriate NRT	×	✓
	Lack of expertise. Lack of experience regarding smoking cessation in general and during pregnancy	×	✓
	Accessibility issues. Service not being local, waiting long to get an appointment or getting appointments at inconvenient times	✓	✓
Financial incentives	Problems with getting the vouchers	✓	*N/A*

"... she gave me the patch where I wanted the highest patch that I could have because I've been smoking 20 24/7, they actually told me the most I could have was a 20 mg patch, which now I've been told by the midwife that's not true.... The patch didn't seem to be working. And then when I told my midwife it didn't work and she said it was, erm, that I could have more than a 20 mg patch. Where I'd got told that was all I could have... I was pregnant I wasn't allowed the highest dose I could have was the 20 mg patch... I wouldn't be smoking now If the pharmacist had give me the right amount" (Participant09, control group)

This NRT-provision problem was also discussed in relation to the services' lack of suggestions regarding alternative aids for women who were experiencing side effects with their existing treatment:

".... patches... because I've got eczema..... and they irritate my skin... No I went back, erm, and I tried the inhalers, but I didn't like them, they give me a sore throat and I didn't like when you suck on them you get a nasty taste in your mouth... And I have tried the gum but I don't like them they sort of burn your tongue and that... So I like, sort of run out of options. I didn't know what else I could try really..." (Participant07, control group; 8:16-24; 9:1-9)

It also seems to have stemmed from the specific prescription protocols adopted by the services:

I remember running out [of lozenge] not being able to get an appointment so... Basically my doctor... you'd phone at half eight in the morning it's engaged for ages. By the time you get through you can't get an appointment but now they've changed the rules. The doctor I went to see him last time I said, "Look please I can do it on... it's going to take me a month to get an appointment with your smoking nurse here" and I said, "can't you just give me the prescription now while I'm waiting?" But he wouldn't."(Participant34, control group; 18:1-18)

Not receiving the appropriate NRT appears associated to smoking cessation counsellors' lack of expertise, which was described as an additional factor inhibiting the efforts of non-incentivised women:

"I said to her, erm, er, yeah about me being pregnant and still carrying the lozenges she's like "Yeah." I said I've got patches at home can I still use them, like can I start on them again rather than give me more, they're from last year they're still in date though? And she said, "I've never dealt with a pregnant woman before."" (Participant34, control group)

This lack of expertise was perceived as generalised and not only in relation to smoking cessation during pregnancy:

"Actually she was actually reading off the form, so it wasn't like she knew it, she was reading it from a book when I kept signing it saying... And she was reading from there about the cravings and how the patch works and if I need to go in and talk to them. She wasn't saying it off her head, she was reading it off a form...[]... I think that's... she didn't know but really that's wrong because they're a pharmacy. Because they're a Stop Smo–... how you can stop smoking they should have all the right information. So I think someone needs to go to them and see if they have got the right information." (Participant09, control group)

The above issues were only raised by women who were not participating in the incentive scheme for cessation. Given that access to NRT was meant to be identical across the two groups, this finding raises questions regarding whether it reflects differences in perception, or actual differences in service provision. These possibilities will be discussed in the next section.

Incentivised women were unique in their descriptions of the inhibiting effects of encountering problems with obtaining the vouchers, which they perceived as having compromised their smoking cessation attempt:

"Well it didn't work very well because the first week we went my voucher came, but it didn't come to my address it came to another address and they sent it on. And then the next time I went to the chemist for the next test I didn't tell him that he hasn't got my address right, and my voucher never came.... that put me off then" (Participant19, incentivised group)

Discussion

Women in the two groups reported comparable reasons for wanting to stop smoking during pregnancy. While citing broadly similar factors as influencing their quit attempts, their accounts differed with regards to their experiences of the Stop-Smoking Services. Women who were incentivised described the motivating experience of being monitored and receiving feedback on their progress. Non-incentivised women reported problems receiving the appropriate Nicotine Replacement Therapy, which they described as having a detrimental effect on their cessation efforts.

Reasons for wanting to stop smoking

Although women in the two groups reported similar motivations for trying to stop smoking, the accounts of incentivised women differed with regards to the mention of financial incentives. Attainment of the incentives by those in the incentivised group, however, was not described as a primary reason for attempting to quit smoking, but was referred to as an "added bonus" for doing something they were already motivated to do. The incentives therefore were not described as having an influential role in women's decisions to stop smoking. This is consistent with the findings of a recent investigation showing that the majority of quitters,

among non-pregnant smokers, did not consider incentive-attainment as a main reason for quitting smoking [28]. There are three possible explanations for this finding.

Firstly, it may reflect an actual failure of incentives to influence women's motivation to stop smoking. The value of incentives offered in the current scheme was considerably smaller (more than ten-fold less) than that offered in the trials from which there is evidence of effectiveness [11-13]. They were also offered as fixed sums at fixed periods of time. Consequently, they may have been too small or offered in a way unlikely to influence motivation or shape new behaviours. Initial impressions of the scheme's effectiveness, however, do not appear to support this explanation: a larger number of women from the incentivised group compared to the non-incentivised group were referred to the Stop-Smoking Services. Although this could in part be attributable to midwives' differential engagement with women from each group, it may also reflect incentivised women's greater willingness to be referred to the services and thus greater motivation to stop smoking.

A second possible explanation for the aforementioned finding is that women were not aware of the effect financial incentives had on their motivation to stop smoking. Indeed, people are often unaware of the processes underlying their thoughts and motivation for their behaviours [29-31]. It is therefore possible that financial incentives influenced women's motivation outside their conscious awareness. The mechanisms by which this could occur are unclear. One hypothesis is that incentives work through increasing positive affect, which can be induced by the provision of money [32] and is considered to have a fundamental role in non-conscious motivation [33].

The third explanation for the aforementioned finding is that women were aware of the effect financial incentives had on their motivation to stop smoking but were unwilling to admit it. Smoking during pregnancy is surrounded by social stigma. The majority of people are critical of pregnant smokers and view smoking during pregnancy as an indication of women not taking the responsibilities of motherhood seriously [34]. As such, pregnant women often perceive pressure to stop smoking [35], with people feeling that they should do so for medical and social reasons [36]. The use of financial incentives for health promotion is also surrounded by negative attitudes, with people often finding such interventions unacceptable [37] and arguing that individuals should not be paid to do things they should do anyway [38]. Taken together these negative attitudes may have lead women in the present study to feel pressure to focus more on the health reasons for quitting smoking, such as for the health of their baby and underplay the influence of incentives.

Factors influencing quit attempts

While women in the two groups perceived broadly similar factors as having influenced their quitting efforts, their accounts differed with regards to their dissimilar experiences of the Stop Smoking Services. Incentivised women described the motivating experience of being monitored and receiving feedback on their progress. Non-incentivised women on the other hand described the detrimental effect of not receiving the appropriate Nicotine Replacement Therapy (NRT). There are at least two possible explanations for these differences.

Firstly, given that access to the services and their delivery was meant to be identical across groups, findings may represent a difference in perception that is not reflected in actual delivery of the services. Specifically, differences in women's levels of engagement with the services may have influenced how they perceived them. Repeated exposure to novel stimuli increases liking [39]. Accordingly, incentivised women's greater use of the services, which appeared related to the provision of incentives, may have led them to focus more on the services' positive aspects. Similarly, the lack of engagement by non-incentivised women may have led them to focus on the negative aspects. Exposure can also have positive effects on affect [40,41] which has been shown to influence thinking, and the evaluation of events [42-44] as well as attitude formation [45]. The provision of money has also been shown to induce positive affect [32]. Consequently, differences in perception might have resulted from differences in positive affect. Furthermore, given that affect generated by one stimulus can be transferred to another [46,47], the positive affect resulting from incentive-attainment may have generalised to the context in which this occurred, i.e. the Stop-Smoking Services, thus leading incentivised women to perceive the services more positively. If differences in support are perceived, rather than actual, and reflect a differential engagement with the services, then the use of incentives might be effective to the extent that they increase pregnant smokers' involvement with the services.

A second explanation for the aforementioned perceived differences is that they may reflect an actual difference in women's experience of the services. This may have resulted from differential engagement with the services, related to the provision of incentives, as well as differential delivery of the services. The latter may have resulted regardless of the intention to keep the services identical across groups. The incentive scheme was not randomised across services, but rather was provided in different parts of a geographical area in England. It is

therefore possible that service delivery differed in these areas. Indeed, it is accepted that Services vary in the types of interventions they choose to provide and their approaches to delivery depending on local circumstances and patients' preferences [48,49]. Although guidelines exist with regards to the elements all interventions should include, such as CO monitoring and delivery of progress related feedback, [49] provision of these varies greatly within the NHS Stop Smoking Services [50]. Differences may have also been related to the provision of financial incentives. Incentivised women appeared to be using the services more as a result of the incentives. This greater engagement may have given women in this group more of an opportunity to experience service-related support. Furthermore, because voucher delivery was contingent upon biochemically confirmed smoking cessation, monitoring of smoking behaviour and provision of related feedback from the services might have been more regular for incentivised women. This would explain the absence of these themes from the accounts of non-incentivised women. Moreover, being involved in a programme specifically aimed at pregnant smokers may have led smoking cessation counsellors included in the financial-incentives scheme to receive more education and training about the NRT aids allowed during pregnancy. Absence of such training, due to the lack of involvement with a scheme designed for pregnant smokers, could explain non-incentivised women's experiences of problems with NRT-provision. Indeed, women in this group discussed these problems, in relation to service providers' inadequate knowledge and expertise.

If differences in the delivery of the Stop Smoking Services are actual rather than perceived and if the incentives scheme is shown to be effective in promoting smoking cessation, then one possible explanation would be that its impact is due wholly or in part to increased levels of support from the services, provided in the form of monitoring, progress-related feedback and/or delivery of appropriate NRT. Given the exploratory nature of the current study, in addition to the lack of a formal evaluation of the effectiveness of the incentive scheme, this hypothesis has not yet been tested. Further research is necessary to establish whether the potential effectiveness of financial incentives is indeed mediated by increased levels of support from the services. If this is the case, it may be possible to improve smoking cessation rates by furthering service providers' training and ensuring delivery of regular monitoring and progress-related feedback, rather than providing incentives. However, while there is some evidence to suggest the effectiveness of NRT in reducing smoking in pregnancy [14], biochemical risk assessment, including CO measurement and feedback, does not appear to aid smoking cessation [51]. This finding could be taken as an indication that incentivised women's perceptions of the beneficial influence of monitoring and feedback provision, in reality, may not have necessarily affected their cessation success. Further research is necessary to elucidate the role of service-support in the effectiveness of financial incentives for smoking cessation during pregnancy and to clarify the role of other potentially important variables in the mediation of the impact of financial incentives for smoking cessation during pregnancy.

Strengths and limitations

The present study has certain important strengths. First, it is the first investigation attempting to determine how financial incentive schemes for smoking cessation during pregnancy may have their effects. Consequently, it is the first to explore the experiences and perceptions of pregnant smokers who have been incentivised for cessation and compare them with those of pregnant smokers not receiving incentives. This comparative design allowed for identification and exploration of the factors that are potentially important for smoking cessation during pregnancy. Finally, the strength of this study also lays in the size of its sample: it is one of the largest interview-based studies of pregnant smokers, focusing on the accounts of thirty-six women. This is important as pregnant smokers are an extremely difficult group to recruit and study.

The current study has certain limitations that restrict assessment of how such incentives may be having an effect. First, the qualitative, exploratory nature of the study does not allow for causal relationships to be established. Second, as mention previously, the incentives scheme is pending formal evaluation and its effectiveness has yet to be established. At the time the interviews were conducted few women in either group had stopped smoking, thereby precluding comparisons within and between groups between quitters and non-quitters.

Conclusion

Regardless of the above limitations, the findings presented here highlight certain important issues about incorporating financial incentives for smoking cessation during pregnancy into the NHS Stop-Smoking Services. These include the need to be cautious about attributing the effects of financial incentives schemes to incentives *per se*, given that such schemes are complex behavioural interventions that might operate through one or more of various pathways, including by increasing individuals' motivation and self-regulation, by changing their engagement with and provision of support services, or a combination of these.

End notes

[1]The NHS Stop Smoking Services were set up in England in 1999 to provide assistance to smokers motivated

to quit. Services are provided in group or individual sessions, depending on local circumstances and patient preferences. Services vary in the types of interventions they provide and in their approaches to delivery [48]. Guidelines however, specify that Nicotine replacement therapy (NRT), Champix (varenicline) and Zyban (bupropion), in combination with intensive behavioural support should be offered to all smokers using the services. Other elements services should include are: monitoring of carbon monoxide (CO) levels and feedback of results [49]. The guidelines also specify that pregnant smokers should be offered the full range of services, including biochemical verification of smoking status and nicotine replacement therapy [47].

[2] According to the West Midland Regional Observatory the most deprived area within the West Midlands is Birmingham with 39.63% of its Lower Layer Super Output Areas (LSOAs) ranking in the worst 10% in England and an average IMD score of 38. 41.

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Authors' contributions

EM collected and analysed the data for this study and drafted the manuscript. FV contributed in analysing and interpreting the findings and participated in drafting the manuscript. TM designed the study's method and participated in interpreting the findings and drafting the manuscript. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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Appendix 5.2: Participant information sheet

Institute of Psychiatry
Department of Psychology (at Guy's)
Health Psychology Section

5th Floor Bermondsey Wing
Guy's Campus
London
SE1 9RT
Tel + 44 (0)20 7188 0192
Fax + 44 (0)20 7188 0195

Would you like to earn £20 while taking about your experiences of trying to quit smoking during pregnancy?

You are being invited to take part in a study, organised by researchers at King's College London, who are working closely with Birmingham East and North Primary Care Trust. Before you decide whether to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with friends, relatives or your GP if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

What is the purpose of the study?
Many pregnant women try to quit smoking each year, many using the help of NHS Stop Smoking Services.
While many are helped, not everyone manages to quit.
We would like to invite you to take part in a study to learn about women's experiences of trying to stop smoking, their reasons for wanting to quit and their attitudes towards smoking when pregnant. We hope these experiences and attitudes will help us to develop services to make them even more effective.

Why have I been chosen?
You are being invited to take part because you have been identified as a pregnant woman who registered with the stop smoking services in Birmingham in the past 6 months. You may recall that you agreed to be contacted by the research team when you talked to the "Call to Quit" service earlier in your pregnancy.

Do I have to take part?
No, taking part is voluntary. It is up to you to decide whether or not to take part. If you do decide to take part we will ask you to sign a consent form and give you a copy of this information sheet and the consent form to keep. If you decide to take part you are still free to withdraw at any time. If you decide not to take part you do not have to give a reason, nobody will be upset and the standard of care you receive will not be affected.

What will I be asked to do if I take part?
You will be interviewed by a researcher who will ask you about your experiences of trying to stop smoking. The interview will take between 30 minutes and one hour. You can choose whether you would like to be interviewed at home or in a local community centre. If you choose to be interviewed in a local community centre, you will be reimbursed for all travel expenses. **You will also receive £20** to compensate for the time you spent participating in the interview. The interview will be tape-recorded. Also, after being interviewed you will be asked to complete a computerised task, which will take approximately 15 minutes and two short questionnaires. The purpose of these is to assess your attitudes towards smoking and your reasons for wanting to quit. Please

note that you are not expected to have any computers skills to be able to complete the computer task.

What are the possible downsides of taking part?
We do not expect any downsides of taking part. In addition your normal care by your midwife will not be affected.

What are the possible benefits in taking part?
Taking part in the study will help us develop the stop smoking service for pregnant women.

Will my taking part in this study be kept confidential?
All the information we collect from you will be treated in confidence. The Interview will be transcribed and identified by a code, not your name. All information will be used for research purposes only. It will not be possible to identify you from any report about this study.

What will happen to the results of the research study?
The results of this study may be reported in professional publications or meetings but you will not be identified by name. Should you wish to receive a copy of the results please indicate your preference on the study consent form and provide your name and address.

Is there an independent contact point where I can seek general advice about taking part in research?
If you would like any independent advice about participating in research you can visit Consumers for Ethics in Research (CERES), an organization that offers information and advice on research in the NHS.
Postal address: CERES PO Box 1365 London N16 0BW
Email: info@ceres.org.uk
Web address: http://www.ceres.org.uk/about.htm

What if I have any concerns?
If you have a concern about any aspect of this study, you should ask to speak to the lead researcher on the contact details at this end of this sheet who will do her best to answer your questions.

Alternatively you could contact the Patient Advise and Liaison Service of the Birmingham East and North Primary Care Trust. The service is free and confidential and can be contacted between 9.00am to 4.00pm Monday to Friday**.** A message taking service is available outside these hours or when the line is busy.

- **Tel:** 0800 328 3205
- **Text:** 07974 729 108
- **Fax:** 0121 333 5382
- **Email:** palsbenpct@nhs.net

In the unlikely event that you should have any grounds to complain regarding your treatment during this research and you believe your complaints have not been

adequately dealt with, you will also have the right to take legal action for compensation through King's College London's 'No Fault Compensation Scheme'.

Thank you for considering taking part in this research.

Professor Theresa Marteau
Lead Researcher

Psychology Department (at Guy's), Health Psychology Section, King's College London, 5th Floor Bermondsey Wing, Guy's Campus, London Bridge, SE1 9RT

Tel: 020 7188 0192 Fax: 020 7188 0195 Email: Theresa.marteau@kcl.ac.uk

To take part in the study
If you would like to take part in the study, please complete the slip below and return it as soon as possible. A stamped addressed envelope is included in this pack. **Alternatively call Eleni on 0777 8149 432**

Stop smoking services for pregnant women

I have read the participant information sheet and am interested in taking part in the study. Please contact me to discuss further and to arrange a time and place to meet:

Name: _____

Address: _____

_____

_____

_____

Telephone number: _____

Preferred time
to contact me: _____

Please return to:

Eleni Mantzari
CSI Health
Health Psychology Section
Department of Psychology (at Guy's)
King's College London
5th floor Bermondsey Wing
Guy's Campus
London
SE1 9RT

Appendix 5.3: Consent Form

Consent form, Final Version 1, Dated: 08/09/2009

Participant ID: .....

Consent Form

There are three copies of this form: one for you to keep, one for the study records and one for your patient records

Title of Study	Stop Smoking Services for Pregnant Women: A qualitative study
Name of Lead Researcher	Professor Theresa Marteau

		Please tick box **Yes**	**No**
1	I confirm that I have read and understand the information sheet for this study (Final Version 4) and have had the opportunity to ask questions.	❑	❑
2	I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected. I agree to take part in the above study.	❑	❑
3	I understand that identifiable personal information, such as my name and telephone number, will be collected by the research team at King's College London as part of the research and that they may need to contact me directly during the study. I understand they will keep this confidential within the research team.	❑	❑
4	I confirm that I received £20 to compensate for the time spent participating in the interview	❑	❑
5	I would like a summary of the results of this study (please enter name and address below).	❑	❑

Name _____

Address _____

_____

_____

Name of Patient	Date	Signature
Name of Person taking consent (if different to researcher)	Date	Signature
Researcher	Date	Signature

Appendix 5.4: Interview Topic Guide

1. Background Information

- Age
- Occupation
- Daily activities
- Interests
- Number of household member

2. Smoking History

- Number of years smoked
- How smoking behaviour started
- Number of previous quit attempts (before pregnancy)
- Duration of previous quit attempts

3. Previous quit attempts (before pregnancy)

- Reasons for previous quit attempts (before pregnancy)
- Facilitators
- Difficulties/Obstacles
- Implemented strategies
- Easiness of remaining smoke free
- Reasons for not quitting

4. Current quit attempt

- Reasons for current quit attempt
- Have reasons changed during pregnancy?
- Facilitators
- Difficulties/Obstacles
- Implemented strategies
- Easiness of remaining smoke free
- Reasons for not quitting
- Factors that would encourage another quit attempt
- Importance of not smoking
- Reasons for importance

- Confidence of staying smoke free during pregnancy and reasons for confidence
- Confidence of staying smoke free after delivery and reasons for confidence

5. Referral to services

- Description of referral process
- Time-interval between referral and 1st appointment
- Smoking status and quit attempts between referral and appointment attendance
- If not attempt was made ask why

6. Experience of Stop-Smoking Services

- Description of services
- Helpful elements
- Less helpful elements
- Suggestions for improvements

7. Incentive-schemes

- Thought and feels about existence of such schemes
- Preferences regarding cash vs. voucher for baby stuff or voucher for cosmetics/clothes
- Preferences regarding whether cash should be provided weekly/monthly or in a lump sum

Further comments/suggestions

Appendix 5.5: Framework – Quit attempt during pregnancy

Incentivised group

	No of cigarettes smoked before attempt	Reason for initiating attempt	Overview of attempt	Outcome	Facilitators	Obstacles	Strategies	Goal
SSPW14	Before quitting about 10/day (18:13), most during the evening (18:11). But when drinking or going clubbing she'd have about 30/40 (18:18-19)	The pregnancy has given her that extra willpower, extra reason- without which there wouldn't have been no reason to make her quit (7:8-12). She's pregnant and it's important that her kids have the best start in life and best health (26:19-21) The vouchers gave her the incentive to stop smoking (2:9-10) Quitting is better for your health, you can do more and she'd have more money (7:15-17) Because your kids look up to you and if they see you smoking hey think it's alright for them to smoke and it's not She doesn't want her lads to smoke because it's not good for their health as she's aware that smoking increases your chances of cancer, and other medical things. She says you wouldn't want to get old one day to find out you've got cancer. (28:7-11). She's got less of chance of her kids smoking if she doesn't smoke (22:21-23). Because she doesn't want to waste money on the fags no more (22:17-19)	Quit completely within a day and did not touch another fag (8:6-8) Used services: .Attended appointments (8:5), received vouchers (9:10)and was prescribed the inhaler (11:11)	Has quit for bout 7 months (8:11-20). From set quit date till present and has not touched another fag(8:18)	Last time she did it because she had to. This time she did it because she wanted to. (21:21-22). Pregnancy gave her the extra willpower (7:8-12) The thought that her baby is going to be smoking too has put her off smoking when stressed (9:4-7) The thought that she needs to pass the no-smoking thing to get her vouchers (9:9-10) made her think that it's not worth risking (9:13) The vouchers were a really good incentive because that's what made her give up (2:9-10 11:20-21) When taken off the scheme what helped her not smoke was the thought of what if she didn't get on the course again (16:21) She's got a strong will (33:17; 25:15) The inhaler helped (19:14) and worked while she was still craving (7:2). She found it easier with the inhaler because she didn't have the willpower as she did when she was young (11:11-12). It helped with taking the edge off (22:4-5)I. When she smells people smoking around her she can't stand it, it's vile (17:10-11) She now realises how bad your sense of smell is when you smoke (17-13-14). She can smell a lot more than she used to smell and she can smell if someone's been smoking really strongly. She says that when you're not a smoker you can really tell how strong it is and that that little baby must be feeling the smoke really badly (17:17-22; 18:1-2) She realises that her body reacts to things better (20:7-8) she doesn't see the point in ruining her health after she's given up (22:21-23)	With first pregnancy she did everything by the book – stopped smoking and drinking- but this time round she's already done it all once and it's not exciting when your having your 2nd child (2:17-20) She' not as strong willed now as she used to be (3:17-18) Socialising is difficult (17:1) She still goes out and has an occasional drink and that's when she find it hard (6:5-6) (18:5-8). When she first gave up that's when she was finding it the hardest (6:7-8). She felt she needed a fag because she's not used to drinking without smoking (6:12) When stressed she's thought that she could do with a fag because it calms her down (9:3-4) She was taken off the voucher scheme because she missed one appointment and nearly started again (2:10-11). She thought that there was no point (14:16-19) and thought about smoking (16:20) She weren't too sure whether she should bother or not (she had 2 minds) because she knew people that were smoking when pregnant and their kinds were fine and her first son has asthma even though she wasn't smoking during that pregnancy, so she doesn't find it fair (11:13-19)	When taken off the scheme and thought about smoking she didn't because she wasn't craving and thought she didn't need to crave, she didn't need to smoke or want to smoke and thought about the baby (17:5-8) and the vouchers (16:21) She thinks that when pregnant you get confused whether you are craving fags or food so she just started eating things (21:10-16) When she was craving really badly she'd be looking all over for the inhaler (5:1-5). used the inhaler when she had cravings (19:15-16) and when she had the urge to buy fags (20:7).	She's going to remain smoke free after the birth (22:17)
SSPW20	Before falling pregnant she used to smoke about 20/day (7:4)	She's pregnant and she shouldn't be smoking (5:5-6) People ask her whether she would give a new born baby a cigarette and telling her that she's	When found out she was pregnant she cut straight down (12:21-23;13:11) from	Completely quit for two/three days (7:2). Has cut down to 5 or 6 (10:12) from	What has helped her cut down is having her son and being pregnant and knowing that every fag affects her baby making her think that she can't smoke as many because it's really bad (12:15-20) Found it easy to cut down because she knew that she could	When trying to quit she gave in to fags when other people would go out for a fag because normally she would go out with them and have fag conversations (8:7-11). This would happen when at the pub as well (13-17)	When trying to quit completely she'd tell herself that there's no point in having a fag because she'd gone the whole day without having now so there's no point in ruining that (8:2-5)	Her goal is to smoke 5-6 cigarettes a day (20:3; 30:12, 31:11)

		damaging her baby (5:6-9, 13) Because smoking is expensive (6:4, 6; 13:14) The midwife told her that if she quit smoking she would get £200 and she said that she'd quit (26:19-21) Family have died from emphysema and smoking and she sees old people coughing and dying because they've been smoking all their life and thinks she's going to end up like that (6:8-12) She looks at old people and can tell which ones smoke because they've got really bad skin and saggy faces and she doesn't want to look old before she actually is (4:22-23; 5:1-2) She want to be able to do things like run after her son and not get tired (5:4-5) Tried to quit completely because her midwife told her to give it a go and thought she might as well (15:20-21, 23) Because she didn't try it with her first pregnancy she thought she'd give it a go this time and try and experience what it's like to go through it (15:14-16)	20 (7:4) to 5/6 (10:12) Did not find it difficult to cut down (14:1-4). She tried quitting for two/three days (7:2) when the midwife told her about these smoking classes that she could go to (13:1-4)but found it hard (5:21-22). She attended two smoking cessation classes (19:6) received vouchers(24:17-21) and was prescribed the nicorette inhaler (17:9)	the time she fell pregnant (7:4) till present	have a cigarette (14:8). When she's got fags she's not really bothered (14:14-14; 15:9) When attending the smoking classes she tried quitting and cut down even more and was having a few drags of someone's fag a day (17:21-23, 18:1) because she knew that she'd get into trouble by the man who'd know that her levels had gone up (18:4-5).She was constantly thinking that she had to keep her carbon monoxide levels down so she didn't get into trouble (18:7-8). She was afraid of being told off for not trying to quit (18:16-17). She wanted to show that she was actually trying (18:24) so he'll keep helping (19:2)	Other people smoking around her used to make her feel that she needs a fag because she'd smoked other people's smoke (9:8, 10) The fact that people where watching her and making comments about why she was bothering with quitting when attending the appointments put her off going to the services (24:1-3) Found it a bit difficult to quit completely when her partner smoked but not really bothered (33:4-5, 14-15) When partner or people refuse to give her fags or tell her that she's not supposed to smoke it makes it worse and winds her up, has the opposite effect and makes her want to smoke more(33:21-23, 34:2-19) She says there's too much stress (5:24) She says there's too much stress (5:24) For two days she did well not having her morning fag and then she was too stressed and needed to have a cigarette (7:10-12) She's used to having a morning fag when her son watched telly (9:17-18) and did well for two days not having (7:9-11) it but she missed it. 9:13) She say's she she'd gotten into her routine of what she does and she has a cigarette when she does specific things, like after dinner, which she looks forward to (31:16-22) When thinking of old people who are dying because they've been smoking all their life she wonder's why she's bothering smoking. But then she thinks to herself that she won't end up like that (10-13) She says she's not really smoking that much now that she's cut down so it can't harm the baby that much (12:19-20) She wanted to carry on with quitting smoking but when it came to the 2nd week after she's seen her carbon monoxide levels go down she thought she's doing well and she can go back to smoking her five/six fags a day because she wouldn't see the man till the following Thursday. But she never went back (20:1-8) She smoked all the way through her first pregnancy and her son came out fine (30:18-19). She also know a lot of people that smoked through their pregnancies and everything was alright (31:1-3) She knows inside her head that she could get something from bad from smoking but she thinks it won't happen to her (32:16-17) She goes to a pub and will get bored so she gets up and goes outside and she talks to other people. If she didn't smoke she'd be just sitting there and that's boring (8:13-17, 21) People tell her that by smoking it's like sticking a cigarette in a newborn's mouth. But she still	When dealing with the morning fag she would take a bath at the time she would normally have the fag and when done she told herself that there's no point in having it now because it's two hours later and she hasn't had it (10:4-5) In trying to cut down she told herself that there's not point in having 20 cigarettes a day and that she's being greedy (13:16, 18) When had an urge to smoke she would pick up her son and play with him so she couldn't have a fag (7:18-19) When partner when out to smoke she went on the computer and tried to concentrate on something else and not think about it, so she didn't go out with him (33:5-13) Got something to eat when had an urge to smoke (7:16) When had an urge to smoke she'd keep puffing on the inhaler (8:1-2) She doesn't smoke a whole fag. She smokes them in two's (meaning half a fag) (10:18-20). When she's on her own she smokes half and saves the rest for later (10:1-2) or throws it or gives it to someone else (10:10) In trying to deal with the habit of the morning fag she would tell herself that she wouldn't have a fag but go have a bath instead (9:19-20) Didn't buy fags when trying to completely quit (7:21) When smoking 20 fags per day she'd smoke a whole fag and then sit down and two minutes later pick up the box and smoke another one. Although she still is in the habit of picking up the box she puts it straight down and realises she doesn't need one (11:19-23, 12:1-3, 5-12) She has one when she actually needs one not just for the sake of having one (13:20-21, 14:17)	

						doesn't see it like that now that she's pregnant.(5:14-15, 19) even though she knows that the smoke goes to her blood and the baby (5:20-21) She enjoys smoking (31:21; 32:1) She says she really wants' to quit but she thinks about quitting then she doesn't want to (31:13-14) Thinking that she had to quit smoking because she was going to the smoking classes made her need a fag (16:18-20). She stressed about quitting (16:15-17) Knowing that she can' t have a fag makes her stressed and makes her want more and more (14:11-14) and makes her run around the house thinking that she could have had 10 fags by now and hasn't got any (15:1-3) She thought she would get the £200 and then have a fag (26:21-24) She doesn't see quitting as that important (30:12; 31:3-4). It doesn't really bother her (31:11).		
SSPW01	N/A	For the baby (8:5). She doesn't want nothing to happen to the baby. She wants it healthy when it comes out (12:10-11) She thinks it's a better life for the kids (7:10)- She doesn't want her two kids to see her smoking, She doesn't want them to grow-up smoking (18:15-16) It's getting too much buying all the fags – she can't afford it (7:8-10). She and her partner used to write down how much it would cost buying the fags and used to add it all up and said that they could be going on holiday with that amount (21:4-9) She hasn't really thought about herself, just the baby and everyone else (8:11-12) Because they haven't said much about what harm it does to the baby and doesn't want to take that risk of carrying on smoking and hurting the baby (24:19-22) she doesn't want the or her children breathing in the smoke and rubbish and grow up smoking (18:13-16)	She made the decision about 3 weeks after she found out she was pregnant when she told the midwife that she was ready to quit (6:17-23) She is getting help at the chemist (6:2). She's having the patches and the lozenges (6:11-12)	Has quit since about three weeks after she found out she was pregnant (6:17-18) till present. Her last cigarette was about 3 months ago (6:9. It was difficult (8:17)	The first thing she thinks when having an urge to smoke is what it'll do to the baby. She doesn't want nothing to happen to it, so she thinks no she can't because of the baby (12:10-13). It's the baby that goes through her head (12:15) Her partner has quit smoking – he's on the same scheme (7:11-12). That makes it easier (7:17-21). It helps not seeing each other smoke (10:10). Her partner wanted to quit during this pregnancy as well (22:18-19) Her family have helped her by not smoking anywhere near her and by keeping well away from her, something they also did during the other quit attempts (19: 12-24). They have even threatened if the see a fag in her mouth to ram it down her throat and that they will hurt her (20:4-9) She put her mind to it and she's done it (8:8-9) She's getting help this time and all the support (20:11-13) and is glad about it (21:20:21)because she knows that if she had gotten help in the past she would have quit completely (21:15-17) She's told people that if you want to quit help is out there and that she's getting it and that's important (25:3-5) She's getting help this time and all the support (20:11-13). If she had gotten it in the past she would have quit completely (21:15-17) She doesn't like to smell of smoke now (8:21-22). The smell of it when she goes past people who have smoked is horrible (9:7-9). It put her off (10:21-23)	The first month it was difficult because she used to go out and see other people smoke (8:17-21). She would want a fag and would have the urge to go to the shop and buy a pack (9:4-6)	At first she would think about the vouchers when had an urge to smoke (16:1-4). She would think that she can't smoke because she won't get the vouchers which are helping her with the baby and then they will stop completely (16:6-9) If she gets an urge she tries to distract herself- either go wash up or vacuum or play with the kids or just do something to stop her from having the urge (11:12-15) She and her partner used to write down how much it would cost buying the fags and used to add it all up and said that they could be going on holiday with that amount (21:4-9). What they could have spent on fags they put away in a moneybox to go on holiday (24:2-4)	
SSPW02	N/A	She tried giving up for the baby (5:6). She knows it's better for the baby not to smoke (6:4-5)	She tried twice: Once for a month-6 weeks	Now smokes about half and sometimes a	The thought of the health of the baby literally helped her not smoke (9:10-11) The first week was easy because she'd set her mind to it	She thinks she's quite weak (6:2) and does not have willpower (15:1-2) When first trying to quit during current pregnancy	When using the patches she though she shouldn't need anything else because the	She'd like to give up when the baby is

		She doesn't want to smell of cigarettes when she's going to hold the baby (20:8-9) Doesn't really see herself smoking right up until she's her Nan's age or something like that where she's coughing and yet still smokes (11:8-10) She thought she should (7:17)	(5:10) when she was about 16 weeks pregnant (8:12) Quit completely for a month and didn't have a single drag of a cigarette at all (9:4-5). Then started smoking about 3-4 drags. And she started smoking again (8:1). She decided to try again when the midwife told her about the stop smoking scheme (7:1-4) when she did the vouchers for three weeks (7:12-13) She's attended 3 appointments. She did the vouchers for about three weeks (7:12-13) She had the patches and the chewing gum (11:20) When attending the services the first week was easy not to smoke (17:4) The 2nd week was slightly more difficult (17:22-12)	whole rolly (10:10-18)	(17:4-5) The patches helped with the carvings (15:14) Knowing that someone from the services was going to check whether she was smoking made her not want to smoke because it was like a test (12:5-8). She wanted to prove she was still not smoking (13:17-18)	she was living in supported accommodation and the only way that you would really go and interact with other residents or go outside for some fresh air was for a cigarette. So she was feeling quite isolated and was just in her bedroom all the time (5:11-18). That was the start to carry on smoking (5:20-21) Her partner would also come back upstairs from a cigarette and would smell and she didn't want not to be with him so she thought if you can't beat them join them (5:21-23; 6:1-2). The smell on her partner made her want to have a cigarette (26:3-4) When doing the vouchers the partner hadn't fully given up and that was still quite difficult (13:20-22) because the smell would make her crave and make her think that she'd have a couple of drags (14:2-3). They spend so much time together that she'd feel left out in a sense (18:6-7) Everyone around her smokes, her parents, her partner, so there is no one to give an example (18:20-21) She was quite stressed because she thought she was going to be homeless at one point (6:12-15) When trying to quit she had cravings but didn't smoke and didn't have a single drag of a cigarette at all (9:4-5) She craves cigarettes and coffee, the two thins that she's not allowed (22:16-19) She spoke to other parents and mothers and almost talked herself round to the fact that other people like her Mum and Nan and aunties smoked during their pregnancies so she thought that if they can do it it's fine (6:5-10) When she first wanted to quit it was quit early on in the pregnancy. (8:11-13) Now she's got far into the pregnancy and she's still smoking and she thinks she might as well carry on (8:17-19). She feels like she's gone past a point and thinks she might as well carry on (19:17-18) When she took her first drag after having quit for a month she felt quite lightheaded and quite dizzy and that was almost quite an enjoyable feeling, it wasn't nasty feeling that made her think she's glad she's not smoking. She actually quite liked it so she continued (9:22-23; 10:1-6) The second week of using the services was more difficult because she was thinking that she's actually going to give up smoking now (17:22-23; 18:1-3) She feels that if she really wanted to quit they she really could (21:1-2)	nicotine was going through (15:14-17). For the first week she'd set her mind to it. She said she was going to do it and told herself that since she'd quit for a month before on her own using the services would be a breeze (17:4-13) To deal with the cravings she just started eating more. Because you've got to eat more for when you have the baby she thought she'll just have to eat more (9:7; 12-15) After the trying to quit for a month she thought she'd just have a few drags and share with her partner. She'd have the first quarter and give him the rest (10:11-15)	born. (20:3-5).
SSPW03	N/A	She wanted to quit for ages (5:18) but more help to try when she was pregnant (7:17-19). She wanted to quit because It's not good for the children's health (13:14)	She wanted to quit before her midwife gave her information and asked her about quitting	She's smoking on and off for about three months (8:12; 16)	She got more help when she was pregnant than she did when she wasn't (7:18-20)	She's not one of those people that have got the willpower to just stop (15:6-7) Because her son is at school she used to socialise with people who are smoking (4:20-21).	When she has an urge to smoke she eats (8:19-20)	She really wants not to smoke at all (13:9)

		It's expensive (13:13). She'll see something in the shop thinking that it's only a fiver but then that fiver could go on fags (14:5-7) She says smoking is not good for you (5:20), for your health (7:12; 13:15)	(7:1-10). She's smoked on and off for about three months (8:12; 16)			It's harder to get out of the habit because she's been smoking for so long (2:10-11) It's harder to get out of the habit when you've for people smoking around you (5:1-2) because the smell of smoke is tempting (5:4-5). Having people around her has made it difficult not to smoke (9:11-13) When having a bad day it means smoking (8:14) It's harder to get out of the habit of not smoking during the day (2:11-13) Most people do smoke because it's boredom (3:1-3). Because you've got nothing to do you smoke (3:5-6) She knows that if she wants to do it then she will do it (16:11) She doesn't want to quit smoking and then eat loads but would choose to have more weight rather than smoke because you can shift the weight by going to the gym (19:13-14; 20:1-4) She doesn't go down that smoking centre now (15:7-8)		
SSP04	About 10 a day (18:14)	She was pregnant and she wanted a healthier baby (2:14-16). She told her mum to quit as well because she was pregnant and wanted her baby to be healthy (9:19-20) and be brought up in a healthy environment (9:22-23) She's asthmatic (2:14) and she wanted to be more healthy (4:12) Because she was so tired when she was pregnant she wanted more energy (4:12-14)	When she was 3 months pregnant she decided to quit (3:1-2). She resumed while on holiday (3:3:8-9) and when she returned she told her mum that she wanted to quit (4:21-22) She quit completely when she was pregnant. She started again after she gave birth thinking that she'll just have 3 a day but ended up back on 10 a day (12:6-8) When she quit for a month she was on patches (3:18-19). When she came back she went on patches for two weeks and was then	When she was 3 months pregnant she quit for a month and started again (3:12-15). Then she quit for about 8 months, which is the longest she's ever quit (2:8-10) until a month and a half after she gave birth (11:22-23; 12:1-2). She resumed to lose weight (7:5-6)	Her friends encouraged her to stop and her mum quit as well (9:13-15). Her sister, brother and his girlfriend had stopped smoking so wherever she went no one really smoked, which made it easier (10:9-16) She puts on a lot of weight when she doesn't smoke because she's done it before but because she was pregnant and big anyway it didn't bother her (12:11-15) When she was pregnant she couldn't breathe at all because she's asthmatic. For days she would be lying on the settee thinking she was having asthma attacks so she didn't want to touch another fag (15:11-21) The patches helped her in the beginning because that helped with the cravings (18:8-10). She doesn't think that she would have been able to quit without the patches (18:18-20_ She lapsed once and had a fag and it was vile making her think that she never wanted to put that in her mouth again (11:8-11) When she stopped she felt so great and had more energy all the time. When she used to smoke she was more tired (16:9-15) She found that when she stopped her skin went more healthy (4:17-18) At first she wanted to quit because she was pregnant but then she started seeing changes, like how much energy she had and how much better she could breath and thought she'd never go back to it (19:10-10-17 Her asthma was better and she could breath much better (19:13-15)	She got a bit of cravings when her friends were round smoking (10:18-19) When she went to Malia for two weeks with her friends she got stressed because she couldn't do anything because she was pregnant, like go out or drink so she started smoking again (3:5-9) She was really stressed out one day and lapsed and had a fag (11:16-18) When she went on holiday she wasn't on the patches because she forgot to take them with her and she started smoking again (3:21-23; 4:1-3) She was overweight and she started smoking again (2:20). She put on so much weight having the baby and it was hard to lose it. So she started smoking after she gave birth to control the food cravings (9:3:10). As soon as she started smoking again her weight went down really quick (12:18-20)	She put the money she was saving from not smoking in a tin and saved about £400 over 7 months (5:19-24; 6:1-3) When her friends were round smoking and she got a craving she would try and sit there for a while and it usually went away (10:18-21)	

			referred to the services (5:2-9). She also had the patches throughout her pregnancy but didn't use the highest one (18:11-12		After she gave birth she didn't feel like a cigarette (19:6-7). She didn't fancy one at all and never craved after that (20:9-11			
SSP05	About 20 (5:10)	She wants to quit for the baby (3:9; 12) She wants to quit for her granddaughter (3:9) and her youngest son and all the youngsters in the house (3:11-12); for their health (3:14) and the health of the rest of the family (4:5) Her son has been picking up on the telly ads against smoking and has been asking her why she smokes which makes her want to quit (18:11-18) because it makes her feel sad and think that he will end up being a smoker and that she could have done something to stop it (19:13-19). And she doesn't want him and her granddaughter to breath in the smoke or be smokers (18:18-21) Her children will benefit from the money she'll save from not smoking. She will be able to go out on treats like take them out more to the pictures, the seaside and little day trips out somewhere (3:14-21) The money from smoking soon mounts up and she could support her family better and give them little treats (25:7-10) but this is no t the most important reason (25:17) She wants to quit for the benefits that she'll probably get with her own health (4:3). She want to quit more importantly for her health because she's been harming herself (23:6-7)	She quit for about one week when on the programme (3:2). During her one week quit attempt she had a cigarette on occasion (4:10). She didn't find it easy not to smoke (6:2-4). She's cut down from 20 (11:13-14) and delays smoking to see if she can cut down more (She's been on the programme for about five or four weeks (7:21) and was given patches (9:23) (4:10).	Now she's still smoking but not as many as 20 (11:13-14)	She was determined and looking forward to quitting (7:11-12)	She thinks she's a weak person (9:2) meaning that she gives in too easily (14:6) and gives in to temptations thinking that she'll just have one fag, but one leads to another (14:1-3). It also means that if anything goes wrong she thinks about a cigarette straight away (16:7-8) She feels that she cannot blame her problems for smoking, just herself who's not strong enough to quit (16:21-23) She's an anxious person and she used to suffer with anxiety, making it difficult sometimes not to smoke (12:16-17) She doesn't thin positive very much because she always thinks things are going to go bad (20:13-14) She felt really low and just thought well what's the point (3:4-5), which is where she thinks she always goes wrong (3:5-7). If she's feeling low she thinks that nothing is going right or wonders why should she do this and why should she do that. And then after she sits down and thinks of what she's just done and that she she's broke it that makes her feel even worse (6:15-20) Her mood made her take ten steps back after taking a few steps forward (7:12-13; 16-18) She finds it difficult when other people smoke around her because it's temptation (14:1) She got stress and agro after being on the programme for about a week (3:3-4). Her son got beat up and the police wasn't very helpful and she found that upsetting (10:14-21) which made her light one up without thinking and that's how it all came about again(11:3-5) When she feels more anxious and stressed she find's it difficult not to smoke (12:16-17) Cravings are not a big issue for her. She's craved ore for cigarettes since she's been pregnant but she' tried to say no (13:13-15) She struggles most in the morning because smoking helps her wake up because she has to get up quite early for work. It makes her more alert because she knows she's got a cigarette and can't put it down (4:10-16) It was difficult not to smoke after dinner or before she went to bed because of the habit she's gotten her self into (6:7-9)	When she had a craving she told her self: "no you're not having one. Just have a sweet" (7:7-8) She delays smoking to tell her body that she doesn't need one and that if she's managed without one for an hour then she can do without it for the next hour or so (12:2-5) When she had a craving she played with the baby (granddaughter) or her youngest son, got his homework out, or washed up or done the ironing (5:20-22; 12:13)) She has a game on her phone that she's downloaded and tried to pick that up and play to take her mind off smoking (12:10-12) She managed by eating lots of sweets (5:15) and found she was picking more with food (5:17-18) She bought loads of hard boiled sweets and chewing gum so every time she had a craving she had a sweet (7:5-8) To stop herself from having her morning cigarette, she got up, had a wash first, changed what she was doing and that helped her (4:17-18) When she gets a craving she doesn't have one immediately and tells herself that it's too early or perhaps in the next hour (11:19-20)	She's determined to pack up from the following Sunday, which is Mother's Day (9:23-24; 17:7-8))

						She thinks that the difficult part of quitting for her is getting out of the habit (13:13; 17-18) She smoked a bit when pregnant with her oldest son and through her pregnancy with her youngest son and they turned out fine. But that has not put her at ease. She feels lucky and says that bad things could happen because her sister's son has asthma because she was smoking heavily through out her pregnancy (24:1-23) She thinks smoking calms her down even though she's read that it doesn't, because it gives her 5 minutes away, to smoke a fag where nobody bothers you (12:19-22; 13:1-3)		
SSPW26	The most she's probably smoked is about 14 cigarettes a day at it's heaviest (15:8-9). Before she conceived she smoked about 5-6 a day (23:23)	Since becoming a mother she scared of something happening to her and her daughter being left (4:21-24). She didn't want to smoke and risk her health. Her Mum had a stroke and one of the causes was that she was a really heavy smoker, which scared her and made her want to quit last time. It's not a money issue, it's a health issue (5:1-12; 14-23) She wanted to stop smoking because she was pregnant (24:21-22) And she knew how guilty she felt about even smoking a few cigarettes after she had her daughter (25:1-6)	She'd cut right back when she and her partner decided that they were going to try for another baby. She conceived straight away and did have the time to cut down (23:10-21). Before she joined the services she was trying to reduce the amount she smoked and was down to about 3 cigarettes (28:15-17). She manages to quit completely for a while (29:19). She managed to stop and not smoke at all (29:22-23). She quit as soon as she entered the scheme, at about 8 weeks pregnant (36:8) she didn't have another cigarette (30:17-21) for a period of a couple of months (31:1), two to three months (35:14-15)	She quit completely for a couple of months but then started smoking again (31:1-3) because she lost trust in the services after they told one of her neighbours the reason she visited the chemist (33:12-13). She started smoking one or two in the evening. She never started smoking heavily again (36:13-14). She never thought of trying again before the baby came (37:19-20) but there were periods where she didn't have any cigarettes like when she was 7 months pregnant and went on holiday, she didn't have a cigarette in 5 days (38:8-13)	She so adamantly didn't want to smoke and was so focused on not doing it (40:7-8). She didn't want to smoke (45:20). She's adamant and a stubborn person and once she'd fix a quit date in her mind she wouldn't go back (8:10-11) In the beginning she found it easy to quit because she had cut down to 3 before starting the scheme (45:8-9). Because she's a stubborn person having someone from the services who she didn't know monitor and check on her helped her because of what that person would think about her being pregnant and smoking if he knew she was smoking. Having that support and knowing that she'd have to face somebody and be judged helped (25:14-25; 26:1-2) Going and having the test done and proving to someone that she's not smoking helped (26:16-19). She quit as soon as she entered the scheme she didn't have another cigarette (30:17-21). The lady at the services was horrible and judgemental but that might have actually helped her stop (34:24-25) Fighting the urge to smoke was hard but she knew she was in the scheme and she knew that someone was going to be monitoring what she was doing (28:24-26) After starting smoking again there were a couple of days where she didn't have a cigarette at all because she just didn't want one (37:19-23). like when she was 7 months pregnant and went on holiday, she didn't have a cigarette in 5 days because she didn't' want one (38:8-15), didn't fancy one (38:21-22) because she didn't want to anyone to see her smoking (38:19) and because she wasn't drinking she didn't feel the urge to smoke (38:24, 39:14-15). Also if her daughter was around and up late at times when she would normally have a cigarette she wouldn't want to have a cigarette (39:18-20) She tends never to smoke away from the house so if she is out she never smokes (39:3-8). Partly because she didn't want people to see her when she was pregnant (39:12-13)	She was founding it hard not to have those cigarettes of an evening when her daughter went to bed and she would sit and relax (28:18-22) The fact that the chemist told a person that didn't even know that she'd smoked in the first place the reason she attended the pharmacy completely blew her trust in the scheme and made her start smoking again (33:15). As soon as it happened she sent her husband to go and get some cigarettes because of her stubbornness which made her think sod the lot of you and ended up having a cigarette (32:17:25). It was a pride thing her trying to quit (33:4)and breaking her confidence made her a bit of a rebel and made her think that she's going to do what she wants to do so if she wants a cigarette she'll have a cigarette (37:4-9)). It made her think hat it's her choice and she'll smoke if she wants to (37:14-16)	To quit she used the technique she'd used in the past to stop herself, which was to pick a date in her head which was the date she started the scheme (45:11-14)Setting a quit date in her mind is something she does when ready to quit for herself and makes her feel in control of smoking (9:17-19) She ate tons and tons of carrots and celery. She remembers eating so many crunchy vegetables and that's literally how she was fighting the urges. She'd sit and watch telly and eat them every time she had them (29:1-7) She also watched Paul McKenna on the telly on how to stop smoking and did this tapping think which kept her mind occupied for those few minutes until the craving passed (29:8-13) Before smoking was a pattern, a routine and she could have told what time she was going to go out and smoke . It wasn't like that when she started again. She changed her mindset and It would be that if she felt like one she would have one (38:1-7) and had a few occasions where she didn't smoke at all because she just didn't want to (38:37:19; 38:8-15)	She doesn't have any plans to quit at the moments (43:12-13)

SSPW11		She wanted to quit for the baby and her other child as well as for own health and for financial reasons (5:10-13). She thought she'd give it a try when the midwife told her about the stop smoking services (5:5-7)	She stopped smoking when she was 3 moths pregnant (6:3). She went to the services with her partner (6:12-13) and was given nicotine tablets (6:10).	She's currently not smoking (5:23;6:1-4) and has quit for about 8 months.	Not smoking seemed to get easier as time was passing (15:10) When she had her first son he had asthma and she thought it was because she was smoking through her first pregnancy (4:19-21) which made her decide that she should stop during this pregnancy (5:4) She managed not to smoke because she had willpower, because she did it with her partner, because no one smokes in the house and with the nicotine tablets (6:9-11) She found it helpful that her partner joined her (6:18-19). Having each other to do it kept her determined (9:22). She and her partner would tell each other "No" if one of them had a craving (15:19-20). She thinks it was easier to quit this time because of the tablets (7:18). It also helped not having people around her smoke (8:6-7) She had more energy to do things, which made her feel like going out more and she also had more money to do thins (8:15) She really wanted to stop (10:1) She no longer gets urges to smoke very often (14:13) and being around other smokers does not bother her (14:17-19)	She and her partner were craving for cigarettes which caused stress and arguments between them (6:19-22; 7:1)	To deal with the craving she told herself that she didn't want to smoke and occupied herself (7:7-10) Now if she has an urge to light-up she deals with it by occupying herself, doing something else and telling herself that she doesn't need it (14:11-13). When having an urge to smoke she would also think of the vouchers (16:18-23; 17:1) and how she would not get the extra money for her sons (17:10-15) as well as her baby and how smoking is not good for him (17:7-8)	Because a lot of her family have got breathing problems from smoking, she doesn't think smoking looks very attractive, because of the money and because if she thinks that if you smoke then your children could probably end up smoking (13:9-14)
SSPW16	Probably about 30/40 (11:10)	She solely doing it for her kids, not for herself (2:20). She doesn't want to put her kids through what her partner went through with his parents who were smokers and were severe asthmatics and had to be looked after (7:9-25). She doesn't want to put her daughter in a similar situation, like when her Nan and granddad, whom she's close to, got ill from smoking related diseases (8:1-19). She doesn't want her kids to wonder whether mummy and daddy will survive the night (11:15-18)	When she first found out she was pregnant she wanted to see if she could do the whole 9 months without having a cigarette (11:4-7). Three months ago (13:11) she started cutting down slowly (12:21) instead of coming off them all together in one go (13:1) but hasn't had any days where she hasn't smoked at all (11:22). She waited until she went to the services to cut down so she could listen to what they	She's still smoking but not as much as she was (2:16-17) probably about 10/15 (11:12)	Her daughter says "Mummy I want you off smokes" (3:1-3), and she thinks that's not nice. She's not a very outgoing person. She doesn't go to pubs or out for meals. She stays in. So she's not in social situations where she would be associating with smokers. (10:17-20) She didn't find it difficult to cut down (13:14-15) and didn't have any cravings where she had to tell herself not to have one now (14:6-12). She's finding it a lot better this time round because she's had more help and more support from the HI administrator who understands where she's coming from (16:4-21) and her partner who keeps telling her she's doing fine when she feels she's not doing too good (17:1-6). If she has an argument with her mother in law and thinks of smoking her partner will sit her down and urge her to ignore her and tell her she's doing brilliant (17:12-15). She says that her partner is her backbone and wouldn't be able to do it without him (18:1-2). Her little girl turns around and her tells her she's doing well and that keeps her going (19:2-3). She doesn't think she could have done it without the patches or support (20:20-22). This time round it's better because she knows she's working for a goal especially with the vouchers (23:3-7)	She knows what the consequences are of smoking when pregnant and they sound nasty but she says that at the end of the day she smoked with her with her first child for 6 months and no harm's come to her. Her mum smokes with all 3 of her kids and no harm came to them (7:1-6) Her father-in-law has not been so good and she's worried about him so that causes her to smoke (11:22-24; 12:2) She wanted to come off smoking in one go but her doctor told her that it could be a shock to her system with the baby so she should do it gradually (13:2-6). At the services she was told exactly the same even though she wanted to come off them immediately (32:20-23) She and her mother-in-law still don't see eye to eye and if they're having an argument she thinks that that's it she's going back on the cigarettes (17:12-13) She thinks what it is with her is boredom because she has to do something with her hands (24:1-3). She gets bored and thinks she needs one (24:10-11)	When she decided to quit she bought a 20 deck and told herself that once that's gone that's it (13:19-20; 14:1)/.She makes sure not to buy more than she needs and it has worked (14:4-5). She goes out and buys a box of ten to last half a day and then goes out again to buy another 10 (12:14-18) If she's had her 15 fags a day and feels like she needs another one she thinks to herself that it will mess up getting her vouchers for her kids and then she'll leave it and if she still feels like it she'll just say it again (23:16-22; 25:11-14). And then she'll just do something else (24:1). She gets her daughter to make a mess so she can clean it up (24:14-15) Even though she's missed her stop smoking appointments she's not tempted to smoke because she thinks she's going to go back down on herself and she uses her partners' parents breathing	She wants to quit for life (29:1) and not touch them again (29:9). She will gradually cut down so that every month she reduces the amount she smokes by 5. She has 4 months of pregnancy left so she reckons she can do it my then (30:3-22)

			have to say (32:17-19) because she was not sure how to go about it (33:14)In the last 4 months she hasn't gone over 15 a day (24:17-18).She's used the patches from the beginning (20:12-14)		Getting the reading and seeing how much it has changed in the past months makes her feel better in herself and feels like she's getting there (27:9-16)		machines to see how good her breathing is. This makes her feels like she's been to the chemist (26:13-20) and feels stronger in herself (27:1-3)	
SSPW19	About 20 a day (11:1)	It wasn't really her that wanted to quit. It was the nurse telling her that she shouldn't smoke when she found out she was pregnant (8:1-3). She didn't want to look bad in from of the medical staff and have them say "Look at her smoking and she's pregnant" (19:16-18)	She got referred to the services 4 months ago and tried to quit and used to inhaler (9:12-13). But she didn't quit at all, not even for a day but had cut down to about 4 a day (10:17-23) for about a week (17:10). She started cutting down when she went to the services because then she got the inhaler (33:11)	She no longer smokes only 4 (17:5)	The urge for a cigarette goes away after 5-10 minutes. Getting over that period is hard. She can do it when out in shops and buses because she can't smoke and she doesn't think about it as much (7:1-11)	She smoked to deal with her boredom (1:12-15) She's tried to quit this time but she doesn't want not to smoke (3:20) because she felt she'd been made to stop (17:18) Unless she wants to do something she won't do it (8:4-5). Being told what to do doesn't help. She doesn't like it (8:7-9) The incentive to quit is not there and what's missing is her wanting to quit (9:15-19). She feels the inhaler didn't work this time because she wasn't ready to do it (11:11-12) She's stressed about this pregnancy because of her age and because she's worrying about whether the baby will have Down's Syndrome but won't have the test because of the needle it involves (3:21-22; 4:1) and smoking is her comfort (4:4). Not knowing is quite stressful. She's stressed about the pregnancy because she's had 3 more kinds and known's what's coming and it's frightening and quite scary (10:8:12) She can not smoke when on the bus or in shops because she can't smoke there but as soon as she's off the bus she wants one (7:8-13) She smoked with her other children and everything was fine with them (8:18-21; 9:1-4; 10:7-8). And she knows she not the only person smoking while they're pregnant (19:18-19) Everyone is smoking around her all the time (11:9) and when she tried to smoke only 4 a day seeing people smoke made her want a cigarette (17:15-16) The 2nd time she went to the services her reading had gone down but it wasn't enough to make her think that that's good enough to stop. She says she doesn't understand what the reading meant on the machine (1:1-5) Not getting any support or praise make her think "What's the point?" (14:14:13-14).	To be able to cut down she ate loads of sweets and tried really hard with the inhaler (11:5-7)	She has thoughts about making another quit attempt in the future only because she's sat down and talked about it now and it's brought things back, Otherwise she says that everyday is just another day and she just plots on doesn't think about thinks seriously enough (22:11-20) When the baby comes she'll cut down and might grab the inhaler (24:8-9)

						When she'd down she wonder's why she's doing this (14:1-2) and she smoked more during those days (14:17-19) She no longer bothers with the inhaler (17:7) When smoking 4 a day she had bad moods with everyone (17:13) and she has depression and doesn't like being in moods (18:4). And even though she used the inhaler she had a constant urge to for nicotine because she was not lighting up a cigarette (18:11-17) She tried to justify herself for smoking while pregnant by looking at the fumes she's breathing in anyway (20:1-2) She doesn't want to get fat because when she gave up before she put on a bit of weight (15:12-15)		
SSPW08	She did about 2-3 days for one packet (6:19). Before she went to the services she would smoke 1-2 a week (13:7)	She wanted to quit because of her age, because she's getting older and she thinks of illnesses and think like that that may be coming, like heart disease (7:13:20) and she thought that maybe she can try to stop smoking. The 2nd baby coming made her decide to quit, for it's health (8:1-8).	She quit since she found out she was pregnant, about 5-6 months ago and hasn't smoked at all during that time (9:6-16). She smoked her last cigarette in September 2009 before she knew she was pregnant (10:15-19). However she says that when she joined the services she was trying to quit (12:16-19). In the beginning she went with her husband who joined her 2-3 times but then stopped (19:11-2; 20:3-4)	She not smoking (9:3-4)	She didn't find it difficult to quit (9:17-18) When she really want to quit she can do it any time (2:5) When she's pregnant she doesn't want to smoke and if she does she feels sick (3:1-6). When she tried to smoke and doesn't really want it she realised that maybe she was pregnant again (4:18-20) Since having her first child they don't smoke in the house so even though her husband is a smoker it didn't bother her (7:7-10) She hasn't had any desire to smoke at all (9:19; 10:1-3) She thinks the voucher can push people stop smoking and is good for the pregnancy (16:12-13) because when you decide to stop smoking if you don't have a target you might just try one or 2 cigarette in the pregnancy but then you realise that you have to go to the pharmacy to do the reading to get the voucher (16:12-23). That helped her stop the 1-2 she had a week (17:8-9). When she joined the cessation she don't even go try for the voucher and also because the people at the pharmacy would know if she smoked or not and that's embarrassing if you're pregnant and still smoking (17:12-17)	In the beginning even though she would fell sick when smoking, because she was used to doing it she still tried to have one (13:1)		As long as she's doing the breastfeeding she'll be able to remain smoke free (29:20) and that's at least 6 months after the baby comes (30:3)
SSPW30		She gave up a million percent for the baby. Because it's not her life, it's her daughter's and she would never risk it (10:8-9) She gave up because she was pregnant not because she wanted to give up (11:9-10)	As soon as she found out she was pregnant she gave up without even thinking about it (10:1-3). As soon as she found out she	She quit thought her pregnancy and has had 10 cigarettes in 14 weeks since giving birth (11:16-17)	It didn't bother her not smoking because it was for somebody else (10:3-4) It was never an issue giving up during her pregnancy (10:9-10, 19) She just knew she wouldn't smoke when it was harming somebody else (11:3-4) She didn't find anything at all tempting (12:16-17) Her partner didn't smoke around her (12:19)	Since giving birth since only smoked in social situations (15:7-8)She smoked at her friends' hen due when her daughter was 6-7 weeks when it was the first time she went out without her and her friend who had a baby was smoking as well, who doesn't smoke (13:16-17; 14:1-3). It was something that they hadn't been able to do while pregnant (14:9-10). When she had a drink she wanted a cigarette (14:10-11)And then she smoked at her friend's	When she went out the first night after giving birth and bought cigarettes she didn't get the brand she used to smoke. She got the lightest ones (14:17-18(	She didn't intent to start smoking after she gave birth (11:14-16) but when she went out the first time after giving birth

		She wouldn't risk anything happening to her baby because she wanted a cigarette (13:1-2)	was like "Right that's it I'm not going to smoke" (10:13-14) . She didn't use any nicotine replacement (10:21-22)		She didn't have any cravings (13:5) She believes she gave up because she always thought she was just giving up while she was pregnant. (17:11-14) Being checked at the services didn't influence her because she didn't even think about smoking while she was pregnant and could confidently give them a reading every time and turn down anything like the patches or gym (22:8-11)	wedding (14:22-23)		she'd planned to smoke. She went out and bought some cigarettes (13:20-21) thinking that they would do for that night and she wouldn't buy anymore (14:19-20) In the future hopefully she won't be smoking properly but might have the odd cigarette socially (37:7-8). She thinks that she will smoke socially (39:6)
SSPW15		She wants to quit because she's pregnant (4:16). She wanted to quit for herself anyway because of her breathing (4:21-22). She was out of breath and couldn't breath (6:1) Finding out she was pregnant was all the more reason (5:2). Because there's a little one growing inside her that she would be harming is she would be smoking (13:13-) Last time she quit only because she was pregnant. This time it's for her and the baby (6:4-5)	She wanted to quit before she found out she was pregnant and the day before she found out she went to the doctor's to get patches and then she found out she was pregnant (4:21-23) She quit 9 weeks ago and hasn't smoked at all (6:13-17)	She not smoking and has quit for 9 weeks (6:6-12)	She doesn't get craving on her own (8:6) She goes outside when her friends smoke but it doesn't bother her (14:7-9)	She didn't find it easy to quit because her mate still smokes around her and that makes her "fingers itchy" because she wants some (6:19-22). She gets craving when people are smoking and drinking (8:6) She was used to using her hands when smoking and would itchy hands when she quit (17:17-18)	When her mates smokers around her and she wants some she thinks "No" (6:22). She tells herself (No you can't have it" because you're pregnant and on that scheme" (7:2-3) She thinks to herself that she doesn't need it anyway (7:6) and that she doesn't want it because they're horrible little thinks (7:8-9). She thinks of the vouchers and how they can help with the baby because she struggles with money (7:12-16) She had a drag one time that her mate lit up and she nearly threw up (14:16-17) She's used the inhaler when socialising (8:16) The vouchers and knowing that she's got to stop smoking because if she blows into that and it comes up that she's smoking she won't get the vouchers has helped her (9:1-5) When she first quit and had itchy hands she'd be flicking her phone off and on get a packet of crisps (17:19-22)	Thought her pregnancy nothing would tempt her or make it difficult not to smoke (12:18-20)
SSPW36	20 a day (15:3)	Guiltiness made her want to quit	She's tried to	She has a fag in	Because her mum thinks she doesn't smoke now when	When she's with her mum and she can't smoke after	She doesn't buy 20 fags and	She would love

		because smoking is bad for the baby and her son is always telling her "Mum you're not supposed to smoke "(12:13-17; 13:1). As soon has she found out she was pregnant she felt guilty for smoking because it's going insider her and into the baby (17:16-18)	stop (4:18). Has been using the inhaler (5:2). She cut down from 20 to ten. Then she tried to limit it and get the 10 to last her 2/3 days (17:5-8). That's taken her about 2-3 months (17:13). She tried cutting down on her own (18:1: 32:8-12). When she joined the scheme she'd cut down (32:15) but was still smoking a lot (32:18). She hasn't had any day where she hasn't smoked at all (39:15-16)	the morning (4:19) and through the day she has half and them another half (4:21). Now She doesn't smoke more than 3-4 a day (17:2)	she's with her she can't smoke out of respect for her. If she did she would go mad (13:3-11). She could be with her mum for 6 hours and she wouldn't have a cigarette (13:15-18) Having all these different stop smoking items from the services encouraged her better (18:19-20) She used to think that she can't smoke because she wouldn't get her voucher (22:6-7)so she'd try and stop even more (22:10) When she goes to the chemist she has to prove to the pharmacists that she's cut down (24:14-15) because it's a bigger goal (24:18) She doesn't smoke in public because she would be embarrassed being pregnant and holding a cigarette (36:12-14; 37:8-12). So she doesn't smoke when socialising (36:19-20). Since being pregnant she can't smoke without having a drink because it makes her feel sick so she won't smoke if she doesn't; have a cold drink (38:1-16). That's affected the amount she smoked (39:4-10) When blowing into the machine the number stay the same she feels she's done good and doesn't; feel guilty in her self (29:12-14).	3-4 hours (14:5) she's itchy and she'd feel it inside that she can't have one and might have a sneaky one when she goes round to the shops (13:18-19; 14:1-2) She thinks of a cigarette after she's eaten (14:7) because she enjoys it then and she's used to it (14:11-18) She'll smoke if she has cigarettes there (16:1) When trying to cut down on her own the cigarettes would always be constantly on her mind (18:1) One week she didn't go to her appointment so she was in the house and then she'd start smoking because she didn't have anything to prove to anybody (23:20;22; 24:1-12). During that week she smoked about 6-7 a day (25:6) She has to have a fag in the morning (33:20) and hen she'll have another one not long after and she'll be happy till about 4-5 o' clock. And then she wants one (34:1-11). If she doesn't have the morning fags she's agitated (34:19-20; 35:1) and will go to the shop and buy some (35:3). If she has a cup of tea in the morning she needs a fag (36:2) The baby is not here and even though she knows it's in her it's not actually here so she tried and forget her on purpose because she feels guilty (45:1-13) Enjoying smoking keeps her from wanting to quit 100% (47:17-19)	hasn't for months. She's stopped that and she buys 10 (15:14-17). She stopped buying 20s when she joined the scheme (32:15) When trying to cut down on her own she'd try and space her cigarettes our (32:17) She tells her partner to take some of her cigarettes and he takes them with him (15:19-20) If she doesn't have cigarettes there she won't go to the shop to buy them because she doesn't want to do that (16:4-5). If she's tempted to go she thinks "no don't" (16:9) She hasn't had an appointment in 3 weeks because from now on she'll do a monthly test but she still blows into the machine (26:17:19; 27:1-8) because she's in that routine and she gets her free inhaler. She goes at least every other week (27:12-19). That's her choice then and that encourages her (28:1) to carry on not smoking (28:18). It helps her because blowing into the machine tells her how much nicotine is in her body and when the number comes up she wants to stay the same because she's done well (29:5-10).She keeps on going to keep herself on target (29:19) She uses the inhaler when she's eaten or when she feels like smoking (32:3-7) and when has an urge to smoke (33:5). She also eats or sleeps to forget about it (33:7-12). She also tried to be with her mum (36:10) If someone smoked around her she looks but tried not to acknowledge it (37:15)	to just stop completely (39:21)
SSPW25	About 20 a day sometimes less (7:8)	She wanted to quit because smoking is so expensive now. She's a singly mum and she couldn't afford to smoke and look after her kids (7:16-18). It's over 5£ to buy a pack of 20 fags. That's over £50 a week. She says	She found it difficult to quit (7:6). She had help off the doctor's and stuff to quit (8:20-21). She	She's quit (3:12) for about 6 months (3:18). She has not smoked any cigarettes at all since	This time she had the willpower to do it where last time she didn't (6:6). Not affording to smoke and look after her kids gave her the willpower to quit this time (7:17-19). She thinks that being older this time helped her have the willpower to just carry instead of giving up so easily (11:1-4) and wiser (33:14-15)	During her bad weeks she would be thinking of a fag and was moody and snappy (11:6-8) The stress of life made trying to quit hard. She was used to having a fag when a bit stressed (31:2-4). She was used to having a fag in the morning when	To deal with her bad weeks she used to buy herself sweets and used to such on them. She used to think that she'll have a sweet instead of a fag (11:13-18). She never thought of just having	She won't start smoking again (22:12-13; 26:18). She will try her hardest not to smoke (27:15)

		that's ridiculous and she could spend that on her kids (7:21-22; 8:1-2). The expense of smoking made her want to quit this time (15:5) She says that with smoking the baby could be smaller and has other health sides and quitting helps (8:4-8) Being pregnant also made her want to try (15:15)	had patches for 3 months and then didn't use them anymore (9:19-19). She had a meeting with the non smoking people, she got her patches and the day after she just stopped (10:9-12). The first few weeks she found it easy and then she felt like it got harder as the time went on. She had her good weeks and her bad weeks (10:17-20) which she dealt with (11:10-11). She had never accessed the services before (16:20-21). From the time she got referred to the services till she got an appointment she didn't try to quit on her own. She waited to have the help (20:4). She needed the help and the patches (20:10-12). She's finished attending the appointments now (22:6) She found the whole experience very hard (30:15), especially in the first couple of months. Then it got easier (30:21-22)	December, just after Christmas (9:2-10)	No one smokes inside a pub anymore so it was ok. It's not so unsociable now (not smoking). So she didn't find it difficult socialising. Also she hasn't drunk being pregnant. (13:1-9). She enjoyed drinking and having a fag but now she has coke (28:3; 14) She only has 3 friends that smoke so she says she's lucky. She doesn't have smokers around her (13:13-19). All her family used to smoke but now they've quit (13:21-22) She says she wanted to quit this time whereas the last time she didn't really want (14:21-22) She was going to the smoking appointments every week and she didn't know what to go and say "I smoked". She knows that helped her (18:7-9). She didn't want to feel like she'd let them down (18:11). She says that if she didn't go she would have started smoking again (19:10-11) She says the services helped her quit (20:15-16). Seeing the people helped her (24:3-4) After about 2 months smoking stopped playing on her mind (30:3-4) She couldn't have done it without the patches (32:13-15) Her asthma is a lot better now that's quit. She hadn't considered that before she quit. It was something she figures out (8:11-18). She is a lot bigger with this pregnancy than she was with the other two and she thinks that's related to her not smoking (23:4-13) She noticed she had a bit more time in the morning because she wasn't sitting in the kitchen having a fag so that was good (31:23; 32:1-5) Smoking is so expensive and to start smoking would be a letdown to herself and her children (27:3-8)	she got up and she missed that (31:9-12) During the most difficult times she would gat a craving about 5 times (32:19-22)	one because if she did she knew she'd just smoke the pack (11:19). She didn't some to be sociable because if she had one she'd be smoking again (12:1-2). She stopped buying cigarettes and she chucked everything away – ashtrays, lighters. In the past she would always keep an ashtray in case someone wanted to smoke but ended up using it herself(12:6-17) She wouldn't stay in a lot. I'd go out and about and would be around her family who doesn't smoke(12:21-23) If she needed a fag she would get up and clean to distract her mind. She would get up and do something (14:10-13) If she had an urge to smoke she would think of the services and that she'd have to say that she'd smoked and get that disappointed look (18:16-20). She never thought that she would smoke and not go to the appointment (19:3) She doesn't know how she dealt with missing her morning fag, She just did. She knew she had to (31:18-19)	

SSPW27	Probably 15-20 a day (18:20)	She was determined to give up because she was pregnant (6:11-12)	In January she started the patches and she was doing well (6:1-2). This time round she and her partner decided to quit because she would have anyway because she had morning sickness straight away before she even knew she was pregnant (7:7-12). If she wasn't pregnant she wouldn't have even tried giving up (12:6-7) She tried quitting on her own while waiting for her appointment and was about down to about 2-3 a day (19:1-11). It took about a week after she went to the services to quit completely (20:8-10). She had just one for 6-7 days and them quit completely (20:16-18)	She quit for 6 weeks (7:21)	She was doing well because she was pregnant (6:2). She was determined. She was giving up (6:10). She managed not to smoke for 6 weeks because there was a reason not to. She was pregnant (8:17-19). She was determined because she was pregnant. She just knew that she wasn't going to do it (9:12-13). She has the willpower in her (9:13). The pregnancy kept her from smoking (12:5) Socialising has gotten easier because you can't smoke in pubs and public places so it doesn't affect her as much (9:19-22) and a lot of her friends and family don't actually smoke now (10:7-8) Her partner wouldn't smoke around her. He tried his hardest not to smoke when she wasn't smoking (10:17-20). Her partner helped her. She says if you've got someone who's quitting with you it's sort of a challenge. To see which one gives up first. Like a competition (18:3-10) About a week and a half after she quit she reached a point where she couldn't even stand the smell of the cigarette (11:17-20) She thinks the patches made it easier. She doesn't know. She thinks it helped her in her mind (20:3-5) She felt really ill when pregnant so she didn't feel like smoking (21:4—6) She found it easy to remain smoke free. She was excited about the pregnancy and she just moved and was thinking that she had to save up money while they were making the house up (21:21; 22:1-2) She says the texts were good because when you give up you don't realise the benefits. But then she got the text message saying that she'd given up for so ling and she should be feeling better was quite good (24:8-22). They probably made a difference in keeping her going (25:1-3)	She had a miscarriage and thought what's the point in giving up(6:4-8). When she found out the first thing she did was have a cigarette (8:6-9; 14:4-6) When trying to quit she found she had the worst urges as soon as she got up (9:8-9) The weeks she didn't smoke she found just wanting to have a cigarette difficult. Because she rolls her cigarettes as well and that's a habit (11:1-2)	If she had an urge to smoke she just wouldn't do it. She would have a bar of chocolate or something like that (9:1-5) If she wanted to smoke or roll a cigarette she'd decorate. That took up a lot of her time (11:5-10) During the first week of her attempt she would just moan a lot when wanting a cigarette (19:17)	She'd planned to start again after the pregnancy (16:20)
SSPW31	Between 10 and 20 (19:16)	She was pregnant again (12:18) She doesn't want to smoke and be out of breath and spend her money on something that's just going into the airways (22:13-15). She doesn't want to get ill and get any kind of lung disease. She has 2 to think about now and knows how she would feel if her mum weren't around, let alone these would feel who are only kids (38:8-16)	She's finding it a lot harder this time to quit compared when she was pregnant to her first son (4:15-17; 12:18). She struggled (5:2). She was on the patches and then had to buy more patches because she ran out. She	She's not smoking (13:14-15). She hasn't smoked got about 8 weeks on her own (22:4)	When she had the patches she had quit completely. She was absolutely fine (13:16-20). It didn't matter how stress she was or anything. She was just fine..she had a patch on (14:1-2) Her morning sickness helped her stop the morning fag (16:9-11). She had it even after the patches had stopped. That helped her for a few weeks (16:14-19) There were a few days where she wouldn't smoke as much. She'd have 2 all day. She's not sure why. Maybe because she was busier or because of her being pregnant and wouldn't smoke outside because she doesn't think it looks very nice when you see a pregnant woman with a bump and a cigarette in her hand. So if she was out all day	With her first pregnancy she was more concerned about her baby and did everything to the book and proper. That took over and she was baby mad. Whereas with this one because she'd already done it, she knows what's to come. So it wasn't so much taking over. She already had her son to look after and deal with. So her pregnancy wasn't the only thing going on . So it wasn't top agenda (5:13-21; 6:1-5) With her first pregnancy she was fussy about going out and wouldn't, whereas this time she is and she'd finding it harder (6:14-16). It's hard when everyone else goes outside and she's still inside and thinks "okay what now?" (7:4-5)	When the patches stopped she felt she had no choice but to go and buy them (14:21-22) When the patches stopped she stuffed her face to try not to smoke (15:3-4). To try not to smoke after she'd eaten she would make herself really busy. She would clean, do housework. Anything to stop her going to the shop because she had just had her dinner and needed a fag (15:19-22; 16:1-3)	She doesn't want to start again. She wants to stop completely (38:17)

			couldn't stop for ages. Then she woke up and said that she doesn't want one and stopped (5:2-5). She started with an 8 week programme and was using the patches and was fine (13:7-8). For 3-4 weeks she then struggled and then one day woke up and said "no I' not doing it anymore" and hasn't since (13:9-15). She went from not having a cigarette a all and being on the patches to waking up and having sometimes 10 a day, to then waking up one day and having none (19:11-14)		she wouldn't smoke. And she wouldn't crave for it either. She didn't want people thinking she was a bad person (17:1-16). She's getting big now and she won't have people looking at her thinking ugh she's pregnant, she's smoking, and that's disgusting. So that's what's putting her off when she's outside with friends (23:17-24) She thinks part of what made her stop is that she thinks that it looks horrible and she hates it (17:22-23) She woke up one day and just didn't want one (19:4-6). She didn't think that she was going to quit. It was because she didn't have time. She had stuff to do. And she was busy. And she didn't have one all day and she didn't have any but she hadn't thought about it and hadn't wanted one. She didn't do anything out of the ordinary. She just didn't want one all day (19:20-23; 20:1-6) She was proud for not smoking that day and she thought she'd see how she got on (20:20-21). After the 2nd day she didn't even wake up wanting one (21:14-15, 22) or even thinking about one (22:2) She finds the smell of smoke vile and disgusting and does her head in (24:9-18). If she were given the patches without having to go to the services she doesn't think it would have been the same because she wouldn't have had anyone to talk to if she needed (37:19-23; 38:1-4) She has a friend staying with her that smokes and she's tempted to ask him for one but he won't give her one anyway because he knows that she's stopped and how well she's done. She he refuses anyway when she asks (24:2-8) Now she doesn't want or crave a cigarette (33:19) She doesn't think she would have been able to quit without the services (36:20-22)	When the programme finished she couldn't do it for 3-4 weeks. Her son was being difficult and she couldn't do it for some reason. There was just something there (13:9-13). She just didn't have it in her to stop for a good few weeks (17:20-21) When the patches stopped she ate to try not to smoke. I could eat and eat and eat until she couldn't eat no more and she'd still be here at the end going "I need one" (15:3-8) She says mornings are hard. She wants a cigarette more then. Because that was a routine. She'd get up in the morning, have a cup of tea and a cigarette. After she'd eaten was also hard (15:12-17) When her morning sickness disappeared she was wondering what to do not to smoke her morning fag because she felt fine (16:11-13). It was a struggle (16:19) There have been a few times when she's been stressed and she's thinking whether she should or shouldn't go to the shop (22:9-10) This quit attempt has been more difficult because there are more things going on now, not just on her own. She'd got things to do with her son when he plays up and she has other things in her life that she didn't have before. So when she gets stressed and when she's arguing with people it's much more tempting to just give up and just go to the shop (23:6-11) When she started smoking again she justified going to the shop and having a cigarette by saying to herself that the vouchers were not a big amount of money (32:11-14)	To prevent herself from smoking her morning fag she tried to convince herself that it was vile. And it smelled and it's disgusting (16:8-9). She constantly made herself busy (16:22) When socializing she doesn't go out with everyone who smokes because then she'd be tempted to say "Just give me one of them" (18:10-11). In such situations she goes to the toilet or something so she's not on her own for a bit (18:14-18) After not wanting to smoke for a day she thought she'd de how she got on for a few more hours (20:21). She woke up the next day and realized she didn't have any fags but had done it the day before and thought she would see if she could do it that day as well (21:2-4). She thought about it more that day but thought "no I'm not going to. I did well yesterday and I'm not going to do it today" (21:8-12) The 2nd day not to smoke she ate a lot, she talked to her son, she went to see friends, she kept herself busy until she went to bed that night (21:18-20) When thinking about whether she should go to the shop or not she starts thinking about the bad points (22:12) When she was asked at the hospital whether she smoked or not she thought about lying and save herself looking bad. Then she thought that she wasn't going to be the one that would be affected, it would be her baby. So she told them the truth and asked for help (25:2-10)	
SSPW32	She used to smoke 40 fags per day (25:5-6)	She wanted to quit for the baby really. She was pregnant (2:23). Mainly for his health and it's a lot healthier for herself and the other children (7:20; 8:1-2) She has two teenage daughters and they get peer pressure for	She used the patches and she was fine on the and did it without them (3:2-3). She's found it a lot easier. She	She still smokes now (3:6). She started again just before she had her son (23:19). She smokes about 4	She smoked during her other pregnancies but she was a lot younger. Now she's older and wiser and she knows what's best.(8:5-12) She thought of how it would affect the baby and that he would have been even smaller and can cause other problems (8:15-19). She was aware of these with her other pregnancies but she didn't pay much attention. She was	She thinks she smokes mainly out of boredom. There are too many hours in the day when she is at home (3:16-17). She's on her own and she gets bored (5:16). When they weaned her off the patches she found it difficult. She got more of an urge to smoke (17:9-12). When they stopped she managed really bad	She stopped everyone smoking in the house (3:3-4; 21:7). That was a bonus because the smell was not there (21:8) When she tried quitting on her own she wouldn't buy cigarettes and wouldn't go to the shop.	She thinks she will keep up with smoking only 4 a day. She thinks she might even try and give up again (25:12-

		smoking so she thought she'd try and they might not want to pick it up (9:11-14)	gave up while she was pregnant but then started smoking again (3:6-7) She was 4 months pregnant when she decided to try and quit and went to the services(9:20). She tried on her own when she found out she was pregnant but she needed help (10:16-18). She tried for a couple of weeks on her own and stopped (12:9; 16-19). She was about 1-2 months pregnant (13:19). Her mum tried to give up at the same time to try and help her and went to the services with her (11:3-4) She didn't try to quit while she was waiting to get her first appointment because she knew she needed help (14:9-10) She started smoking just after she went into labour (16:17-19).Just before she had her son (23:19), a couple a weeks before (24:1)She quit	fags per day (25:5)	younger and thought differently. Everything when over her head (9:3-8) Getting checked at the services on was an incentive to try and do her best(10:1-2). Once she would realise that she'd done boosts it would boost her confidence to keep not smoking (14:15-18) Having her mum try and quit with her was helpful because there was someone else doing it with her and it was a bit of competition (11:9-11). To see who will do better then the other (11:17-18) It helped a lot going down there and speaking to them about it (smoking) (11:13-14) When she's outside she doesn't get the urge to smoke because her mind is occupied. (13:10-11) She doesn't go out and she doesn't drink (13:14-15) The incentive (vouchers) boosted he confidence (19:5-9). She wouldn't think of the vouchers when she was craving a fag but when they would come she would think that she's done well. That she's achieved (20:13-17) If she were in a good mood and had a good day and smelled smoke fags wouldn't cross her mind (21:14-15) Although she's smoking she doesn't smoke half as much now that her baby is here because she's not allowed to smoke in the house cause of cot death and everything (24:11-15). He keeps her occupied and she doesn't think about it because she's with him 24 hrs a day (25:1-3) She had this big bump and was reminded constantly that there's a baby there and she didn't want him inhaling that smoke (27:15-18) She had her family going "no you don't need that, you don't need to pick up a cigarette" (35:20-21) The main incentive for continuing was the children and her own health (16:12-15)	(21:1). It was hard (21:3) If she's had a bad day and she smelled smoke she'd want a fag. She says you are likely to smoke (21:13-14; 19) She started smoking a couple of weeks before she had her son. She thinks she was stuck ore in the house and she was bored and had a lo of friends who smoked and they were round her and that made it harder. So she started smoking again (24:1-9)	She'd send someone else because they are right in front of you when you're at the counter (12:9-14) If she had the urge to smoke she'd clean the house from top to bottom (12:22-23) and keep herself busy (13:2). To deal with the urges she would go down to her mum's because she was doing it as well and they could support each other. Her mum would tell her that she wasn't going to have one (17:17-21) To manage when the patches stopped she tried and kept trying and kept saying she can't do it and that she had to keep stopping smoking (21:3-5) If she smelled smoke and wanted a fag she would try and walk away (21:21)	13)

			completely for about 4 months (16:20-21)					
SSPW17	She used to smoke about 5-6 (6:20)	She wants to quit because se ha a young kid and one on the way (2:18-20) and for her health as well because her son has asthma (3:2-4)	She cut down from 5-6 to one and it was difficult. She's been able to cut down for 2 months (10:10-13). She managed to cut down before she went to the services (10:18-22)	She's smoking just one (6:16-17). She; cut down to one (7:4)	Socialising is not a problem (8:8-9) She thinks the patches have helped her cut down (9:3-4) Some days she doesn't smoke at all because people don't smoke around her (16:11-14)	It's been difficult because of stress (7:11-12). She smokes when she's stressed (16:4-6)	She eats loads (6:16), exercise, go to the shops, distract herself (8:3-5)	She has not intention of quitting completely yet (14:11-15) She won't smoke when the baby is born (18:15)

Control group

	3.1 No of cigarettes smoked before attempt	3.2 Reason for attempt	3.3 Overview of attempt	3.4 Outcome	3.5 Facilitators	3.6Obstacles	3.7Strategies	3.8Goal
SSPW13	20-30 (5:9)	She wanted to quit because of the baby. She knows it's terribly bad for the baby if she's smoking. And after it's born she doesn't want it to breath in the smoke. That's why she stopped. Not necessarily for her health benefits (3:12-18). She says it's not fair on bump (3:20) She says smoking is expensive (19:5) but that wasn't a factor in her decision to quit. She knows she was spending too much money on it but she's earning enough to pay for it (19:12-18)	Cut down as soon as she found at she was pregnant (5:5-7) from about 20-30 to 8-10 (5:9) with the intention of ultimately quitting (8:22). She would have liked to have just stopped but it was difficult to quit the last few which is why she then went to the services (9:2-4). She'd cut down for about 2-3 weeks before getting referred to the services (5:15-16). She managed to cut down very easily (6:2-3) and also quit pretty easily (7:9-11). She stopped smoking when she went to the services (12:9-11). She stopped the next day (12:15) and it was not more or less difficult not to smoke that day than every day since (12:21-22). She didn't find it very difficult (13:12-13) She had half a cigarette on New Year's when her partner nicked one of her dad's cigarettes and one when she was out with some friends a girl who smoked through her pregnancy gave her one (15:18-23; 16:1-2)	She's quit (8:1) when she went to the services (12:11)	Before cutting down she was mostly smoking because of boredom. She would sit down read a magazine and have a cigarette and have another one when it went out to do something. It wasn't necessarily that she craved the nicotine (6:18-22). It felt more of a habit rather than desperately wanting a cigarette (10:1-2). It was a habit not an addiction because it was something she did rather than desperately wanting (9:20-21; 10:1-2). Not having her partner smoke much was a big help (7:21) and her parents in low who live with her aren't smoking as well so she doesn't have any smoke in the house to make her crave (8:11-16). It was easier not to smoke at home because her partner had stopped smoking (15:8). Going to the services with her partner was useful because they were quite competitive and that kept her from smoking because she knew that they were going to go together and see how they'd both done (28:17-28; 29:1-11) It was easier when the baby started moving because then she became more aware of why she's not smoking (8:6-7). She's aware of the baby now (18:3) She doesn't go out much (8:9) It wasn't much of a problem to come home and not have a cigarette because the association wasn't that strong and she could do other stuff (10:11-14) The services helped because of the inhaler which she used on her routes and because she'd informed was someone that she'd made a decision to quit and there was someone relying on her to stop smoking. If she hadn't told anyone she was quitting it wouldn't have really mattered if she still had the odd cigarette (11:3-9). Knowing that the reading had to be good because there was a quantifiable way of seeing if you'd stick to the routine was useful (28:20-23).She' didn't want the disapproval (11:13-15). Her mother was horrified and shocked that she didn't just stop when she found out she was pregnant (11:17-20). Was easier not to smoke at home partially because she knew they'd be more disapproving at home which made her not want to smoke (15:10-11) Not drinking has helped her a lot. Her partner found it harder because he's drinking and it's very much an associated activity (13:22; 14:1-2). Not smoking when at home was easy because she didn't have much of an association with sitting down and smoking and there are ore distractions like reading a book or doing something else (15:13-15) When she smoked on New Year's it wasn't has enjoyable as it was when she was smoking and when she smoked and the second time (when her friend offered her a cigarette) she didn't enjoy it at all, so she hasn't bothered	When having cut down she still smoked 8 which was the ones she had at work (6:5). The only time it was bad as at work because her colleague smokes it was routine to smoke when on rounds dropping off things with various companies (7:14-18). That association was quite difficult to break (7:20). She was used to having a cigarette at certain times (10:7-8).She use to have one before she started work and again she would want the one (9:15-16). It was routine (10:17) Before quitting she thinks she could have cut down even more because it was a habit not an addition ((9:20-21). Those last few she would have because she would think "why can't I have one?" and would have one (10:4-6) Every now and then when the weather is nice and she sits out she fills it more difficult not smoking than at other time (13:2-4) Going out in the evening sometimes is more difficult because some of her friends still smoke and it's big social thing when everybody goes outside to smoke which makes her think that she could do with a cigarette (13:16-21) The other hardest time is lunchtime when she'd usually have a cigarette after lunch. That was probably the most difficult (14:9-11) A girl who smoked through her pregnancy offered her a cigarette telling her not to worry and to have one (16:1-5). This made it more acceptable and made her feel that she there wouldn't be disapproval (17:10-13) On New Year's she and her partner thought hey would have a cigarette because they'd been so good as a treat (16:9-16) She misses smoking but it's the social aspect of it (19:22) She still has a lot of friends that smoke and it's nice going out and having that social activity (20:1-3)	If she had a craving she would use the inhaler (7:6) To break the association of smoking at work she told herself it was bad for the baby (8:3-4) In the evenings it wasn't so much a problem because she just did something else (9:10-13) She removed herself from the tempting situation. She didn't go out after lunch and would stay in the office so she couldn't smoke. And the same with going out. She wouldn't go outside (14:14-18) She would try and remind herself that she wasn't a smokers anymore and she didn't need to smoke (15:1-3)	She's aiming to certainly not smoke while her baby is a baby baby ,but she can't promise forever. She's aiming to remain smoke-free for at least 12 months (18:15-21)

					since (17:1-6). She knows that if she starts again she's not going to enjoy it (19:23) She now hates the smell of smoking in the house (19:5) She hasn't smoked so long so it seems really stupid to start again (19:3-4). It just seems like of waste of time to start again going though all that process (20:1-3)			
SSPW10	About 30 a day (12:7)	She thought it would be more beneficial for the baby and herself to quit (3:7-9). She knows that smoking can cause difference diseases and being pregnant gave her the incentive to try and quit (3:12-15). Money wasn't a priority when trying to quit (18:8-10). It wasn't a financial reason why she decided to stop smoking (18:12-13)	As soon as she found out she was pregnant she wanted to give up. After attending the services she gave up for about 8/9 days (5:9-11) **6:20-22; 1-5).** Then her father was rushed in hospital and she bought a packet and started smoking again (11:13-15). When he got out she cut down (12:1-4) from 30 to 15 (12:7-8)	Quit for 9 days. Then started again. Now she's cut down to 15 (12:4-9)	It didn't really bother her that people were smoking around her but she started being more around people that smoked for the smell. It was comfort to be around the smell She didn't think about smoking or having a cigarette when she was around the smell (6:8-12) because she would be distracted by the conversation she might have been having but the smell would be there (7:17-18). When she's got people to talk to she doesn't think about smoking as much (8:17-22) It got a lot easier after the first 3-4 days (10:7-8)	When quit for 9 days she had cravings (5:20-21). The first few days it was constantly on her mind. She needed a cigarette (10:10-11). It was hard (12:16) She think it was mostly not having anything to do with her hands. Not the cravings so much but more just not knowing what to do. It was just a natural reaction to pick up a cigarette and start smoking with her hands (6:5-9) Being in the house on her own was more difficult than being around people that smoked because she didn't have the distraction or other things to think about as much (8:7-16). When she's in he house she can just light up at any time (8:14-17) After 10 days her father got rushed to the hospital and she didn't care. She needed a cigarette (11:3-5) She's gone through the pregnancy now and has been smoking and she thinks there's now point in quitting now (13:13-18) She feels it's not really worth quitting now (22:3-4).	She just decided that that's what she was going to do and quit for 9 days (5:17-18) To deal with the cravings she would have a piece of fruit or something (5:22), bit her nails down (6:3; 8:4). She didn't keel any cigarette s in the house and the thought of going to the shop and buying some kept her from smoking when alone in he house (9:4-11). If she wanted to smoke she did jobs around the hose, walk the dogs (9:18-22). She tried to keep herself busy and occupied with other things (10:13-15)	She wants to quit (13:7). She's going to try again once the baby's here for the baby's sake (15:5-6). She doesn't want her baby around her smoking (15:15). Once the baby comes she will do her damn hardest to do everything she can not to smoke (22:6-7). She's made up her mind (24:14-15) She says that she'll be smoking like a trooper on the way to the hospital and hopes to come out smoke-free ideally (23:20-22)
SSPW18	**Between 10 and 15 a day (16:12)**	**For the baby (11:17) For herself because she's approaching 40 and in her mind she's always said that she doesn't want to be smoking past the age of 40 because she thinks one has got like a magic number of cigarettes one can smoke before one starts to do some irreparable damage (11:19-22; 12:1-7)**	She was smoking at the earliest stages of her pregnancy (5:11-12) but managed to quit completely (16:4). She cut down and then completely stopped (16:7-9). She cut down to about 5 and then she stopped (16:3). It took a long time to stop completely. She was smoking until her baby was about 6 months inside her (16:15-16). She rates the difficulty of quitting as a 4 (20:21). She wouldn't say that it was a walk in the park (21:1). She didn't get any help from the services (26:5-7)	**She was smoking till 6 months pregnant but now she's quit (16:9; 16:16)**	**She wasn't well during the pregnancy so that was one of the spurs that made her think enough is enough (13:2-6). This pregnancy wasn't quite right she was bleeding and the scans were suggesting that he wasn't growing as quickly as he might. Those things were planting seeds in her head about what he was doing to the child because she was smoking (17:9-23). She kept having those episodes and was very very worried for herself and for the baby (18:11-15). She linked the episodes with the smoking and that helped her get rid of something that she wanted to get rid of anyway(20:5-9). By association, so every time she would have a bleed she would blame a cigarette and smoking (20:11-13) She's fearful of the effects of smoking (18:4) When her husband would come back in after having a cigarette she'd think "phuh he stinks I'm glad I've not had one". So it made it easier (15:9-11) Prayer helped her quit completely. She prayed for help when she had the episodes. During those dark times she turned to God and she thinks that was the**	**It's always difficult because she sais that you get the urge (10:16). She thinks smoking is more of a habit that you associate with other things (10:19-21). It's more of breaking those habits (11:1). She'd come back from school after dropping the kids off and her routine was to come back and have a coffee and a cigarette and it was hard to break that habit (14:14-19) Initially she found it difficult even though she was pregnant because she was going through quite a stressful time and she was very busy (12:9-13)** With her first pregnancy she didn't find it difficult. She was excited with the pregnancy and was focused on the children growing inside her (twins). (8:7-17) **Before she got pregnant she was smoking a lot to keep her weight down and the pregnancy was a big surprise (12:14-12) Her husband smokes as well so in the evening when the children were all in bed they'd go**	**The urge passes quite quickly if you can distract yourself (10:16-17). To break the habits she would just make herself do something else. She would think about the craving and ride it out and think about how well she's done and that she doesn't want to undo it (5-12). She ate cake or read a newspaper or did a crossword, phone a friend, clean the bathroom, got on with something (15:15; 16:3) Every now and then she'd think that she wouldn't\t mind a cigarette but it went very quickly**	**She doesn't want to be a smoker (21:9-16).** She hopes she's not one of the people that start after quitting and she prays (22:9).

					difference. It made her feel stronger and that she could do it (18:15-19). She asked for the strength to resist temptation, to just stop and it seemed almost instantaneous. She felt supported and that anything was possible with God (19:9-19). The difference this time was prayer. She thinks it was the helping hand (32:7-9). Fear and prayer helped her (32:17) **She had willpower (21:2).** **There's the connection in her mind that she'd spoken about it and told somebody that she wanted to do something about it made her do it (28:12-16)** **She's done all this good work and doesn't want to undo it by having a cigarette because she'll set those receptors off (11:9-10)** **She doesn't want to be a smoker(21:9-16)**	**outside and have a cigarette and a chat. It was him that she'd have to let go out by himself and have cigarette (15:1-7)** **She supposes she was a bit reassured in the beginning because she was smoking during her previous pregnancy (17:6-9)** **The hold that smoking had on her was very strong (18:6)** It's easier when the baby is actually here because it's a bit abstract when they're in the tummy (14:5-8)	**because she would go "No you don't". She'd tell herself "no you don't" (21:4-6)**	
SSPW12	**10-15 a day (11:21-22)**	**She's pregnant and she didn't want to smoke through the pregnancy (3:2-5). But before she found out she was pregnant she wanted to quit anyway (6:5-6). It was getting too much..she couldn't afford it (6:8-13). She also suffers from asthma and it was getting worse for it so she wanted to quit because of her health and then she found out she was pregnant and thought that this is the time now (6:14-19). Because she wanted to quit anyway she thought that this was a good chance to quit (7:4-5)** **It's important not to smoke free because she's got a living being growing inside her (10:6-7)**	**She's quit for 5 months (2:14).** **She went from 10-15 a day to none (11:21-22; 12:2).** **She went to the services and was given patches (**7:12-15**) and the inhaler (18:9)** **At first she smoked a few cigarettes when socialising (18:7-9) but then stopped when she used the inhaler (22:4-6). It took about 3 months to come off smoking (24:6-7)**	**She's quit for 5 months (2:14)**	**Thinking of the baby helped her (6:21-22)** **She found it easier to quit when pregnant because all she had in her head was to think of the baby (7:20-21)** **She hasn't had any urges or cravings (8:10-15)** **Being around her partner who smokes doesn't bother her because she's always around someone who smokes (9:1-6). Being around her brother and step dad who smoke is not so hard (20:10-14)** **Her dad sends her to they shop to buy him fags and she wonders how he can pay that price because they've gone shot up since she's quit (9:8-10)** **She doesn't want her baby to come out with the same health problems she and her brother have because her mother smoked when she was pregnant (10:9-17)** **When people smoke around her now she can't stand the smoke. It doesn't appeal to her no more (11:2-10)** **The encouragement from the services helped her (17:10-11)** **Using the inhaler helped her socially (18:13) . After she got it she didn't smoke socially anymore (22:4-6). Going out doesn't bother her no more (24:3). Now she can go outside with her mates while they smoke (25:10)** **When people smoke around her now she can't stand the smoke. It doesn't appeal to her no more (11:2-10)** **She's got a bit more money to herself now and then that money she can spend on the baby (11:14-19)** **She'd done so well for 3 months she thought she couldn't start smoking after 3 months. She doesn't want to smoke again because she's done so well so why would she start again? She made that mistake last time and she doesn't want to do it again (25:19-21; 26:2). She cant afford to star again with a new born baby (26:15-16) and she doesn't want to die at a young age (27:3)**	**Even though she wasn't drinking, when she was with her mates and they smoked At fist she found it difficult when going out (19:13-15). It was awkward for her not to smoke so she was having a fag (19:5-7). Then she got used to it (19:17)** **Compared to when at home it was more difficult going out because she would be around more people who smoked (20:1-8) . When she goes out with her mates a lot of them smoke so she's around more people and watching them and smelling them was difficult because she was craving at the time (20:14-21)** **When socialising the cravings would get the better of her (21:10)**	**If she gets a thought about smoking she thinks of the baby (9:11-15)** **She used the inhaler when she went out with her mates and when she was socialising instead of using a cigarette (18:15-14, 19:2)** **When she went out with her friends she would try not to smoke and could go quite a long time but near then end of night she would start smoking (21:7-8)** **When trying not to smoke socially it was hard at first but then she was thinking that she couldn't do it and that she wasn't going to do it and then she'd stay inside while they all went out for a fag and it was less hassle.** **And then she got used to it (24:11-14, 25:1-2)** **If she had cravings at home she ate. She dealt with them by eating (21:11-15)**	**She doesn't want to smoke (25:19-21). She doesn't want to start back up after the baby's born (10:2)**
SSPW06	**About 10 a day (8:12)**	**She decided to quit when she found out she was pregnant (6:7) She wanted to quit for her baby. She doesn't want to be out of breath when she takes him to the park when he's older. And for**	**She didn't quit. She tried with the inhaler for a couple of days and it didn't work (7:16-17). She did it for a day (8:6)**	**She's smoking at the moment (7:14)**		**She thinks it's hard to stop because smoking has become a habit. She's gotten herself into a routine. She gets up in the morning and the first thing she does is light a cigarette and have a cup of tea (2:18-20; 3:2-3). She felt she needed a cigarette more in the mornings and after having something to eat. It's routine for her (7:21-23; 11:1-4)**	**The day she didn't smoke she just kept telling herself "Don't do it, don't do it" (8:16). She did that because she really wanted to quit (10:12)**	**She says she's going to quit (15:1). She's going to give herself a couple of months to get herself**

		health as well(7:6-12). **She doesn't think it would be funny if anything happened to her and her baby had to grow up without his mum (15:16-17)** **Smoking is expensive and she could be saving that money to take her son on holiday when he's older (18:8-12)** **She wants to prove to people she can to it (19:2-3)**				**When attending the services she was told she wasn't allowed patches being pregnant (7:4)** **She quit for a day and then got to the stage where she just needed a cigarette (8:8-9). It made it worse because it was like someone telling her she couldn't have something when she knew she really wanted it (9:3-5)** **When she was pregnant she was going round to her sister's a lot who smokes so that was harder (10:9:21:10:1-6). Everyone around her smokes and she questions why she should stop when they're all smoking still (17:9-11)** **She was panicking about giving birth and didn't think she would quit (19:7-9)** **She was smoking during her 3 other pregnancies and because her children are fine it didn't worry her much about smoking during the last pregnancy . If something were wrong with one of them she would have been more determined to quit (19:22-23:20:1-11). Because they were all fine she thought to herself that nothing's going to happen (20:15-16)**		**motivated and she's going to go speak to her doctor (16:18-21)**
SSPW07	**At least 20 a day (8:10)**	**Smoking is expensive, it's not good for the kids and it's not good for herself (3:8-9). She wants to quit for herself really (3:11).She has children to look after and wouldn't want to get cancer and dying (18:2-5)** **She felt ready to pack up smoking before she found out she was pregnant anyway. (8:12-13). She wanted to give up when she was pregnant because she had a baby in her and didn't want the smoking to affect it (13:12-14).** **She says there's more pressure from herself to give up when pregnant because the baby doesn't have a choice (13:16-21; 14-1-2)** **Her son see the tv adverts and tells her the he doesn't want her to die (21:20-21; 22:2-4) and tells her off for smoking (21:18)**	**She tried the patches but she's got eczema (8:15-16) and the inhaler (8:22). She attended one smoking cessation appointment (9:18). She didn't quit at all (10:3). She found it extremely difficult to quit during pregnancy (11:16)**	**She's cut down but hasn't quit (10:6). She's smoking about 10 , maybe 15 (10:13-15)**	She felt guilty because of what people were probably thinking of her standing with a bump lighting up a cigarette. That made her feel bad so she didn't smoke as much because she's bothered about what other people are thinking of her (11:21-23; 12:1-4) If she has a packet of cigarettes and knows that she can have one if she wants one she tends not to have one (19:19-21)	**The patches irritate her skin because she has eczema. She tolerated them for a while but they blistered her skin (8:15-20). The inhaler gave her a nasty taste and the gum burnt her tongue. So she ran out of options and didn't know what else to try. She couldn't take the tablet because she was pregnant (9:2-10)** **She says it was difficult because It's stressful when you're pregnant because you're worrying about the baby. Work could also get stressful (10:19-23)** She says smoking sort of calms you down and relaxes you when stressed (11:4-5) What she found most difficult was the cravings (11:19). If she's bored and hasn't got much to do she tends to smoke more (12:15-16) She associates things with smoking like after her dinner she'll go and have a cigarette (16:11-12) Not having cigarettes available makes her need a fag (20:8-9) She was worried about the detriments of smoking to her baby and was getting worked up because nothing was helping her quit hat she smoked even more (23:6-14)	**Trying to keep busy helped her and trying to find things to occupy her time (12:10-12)** **She always makes sure to have cigarettes because she finds it worse when she doesn't have any. If knows she can have one she tends not to smoke as much (19:18-21)** **She questions whether she really needs a cigarette (20:1)** **Some days she will go for quite long without having had a cigarette without realising it. Then she'll try and go a little bit longer before she has another (20:15-20; 21:1-3)**	**She's trying to cut down as much as she can and then knock it on the head (10:7-8)**
SSPW09	**20-25 cigarettes a day (8:7)**	**She has really bad asthma. Her health is in a bad way and on her dad's side of the family there's a thing with cancer. She's lost an aunt and uncle to cancer, and has another**	**She came home from the interview with the services, set a quit date because she couldn't quit straight away. She didn't have a cigarette for 24 hours because she knew that if you put that**	**Didn't manage to quit at all (4:3-6). She managed to cut down to about 15 a day (15:3-4)**	**The inhalator helped because it was helping the hand to mouth habit and when she was inhaling it did feel like smoking a cigarette (8:13-18)** **Being told her daughter wasn't growing kept her from smoking for 48 hours. She needed to give up because her other daughter was born prematurely. She was only one pound ten and she almost lost her. And she**	**She didn't have a substitute (4:8).** **She says smoking is a habit and if she doesn't have a cigarette she finds herself miserable. It's a habit of putting her hands to her mouth. She found her self being moody and unhappy (4:11-17).** **She had really bad craving (4:18-19) more than**	**She waited to see whether the patch would just take time to work and it would eventually work. She was hoping (9:11-14) and that helped her not smoke for 49 hours (10:14)**	**She wants to quit and before she goes back to college she will try a different pharmacy**

		auntie who has breath cancer. So she's worried it could come to her (3:5-22) **When she was pregnant and had a scan she was told that her baby was really small and she knew it was from smoking because she had read about how babies can be small if you smoke. So it wasn't good for her (5:1-15)** **She wants to quit most of all for her health and her children because her older daughter has asthma as well (18:2-3)**	**patch on and have a fag it makes you really dizzy. She then put the patch on (6:18-24; 7;1-4). She tried it for two days (8:10)**		**has two holes in her heart. And she was smoking with her. So to nearly lose one daughter and being told that her other daughter is not growing made her think that she had to try (10:17-22; 11:7)** **Those two days that she was trying not to smoke her partner was good. He didn't smoke in front of her and didn't even put a pack of cigarettes in front of her.** **And he never came in smelling smoke (14:12-20)** **Her baby helped her cut down. Jus knowing that she'd lost the water and that she was smell. Knowing that something could happen to her made her think that she had to stop smoking as many (15:7-16). She had to be monitored daily in case she needed an emergency C section (15:22-23; 16:1-3)**	**usual when she was pregnant. It was what she craved for (5:17-22). The cravings were the most difficult thing (9:4-6)** **She was told that she could only have a low dose patch when she wanted to highest one because she smokes a lot. Later she found out that they weren't right (6:13-16)** **The low dose patch did work for her (7:1-2). She asked for a higher dose but they told her she wasn't allowed to have it because she was pregnant (7:11-15). She says that if she were given the fight amount she wouldn't be smoking now because a 20mg patch didn't do anything for her because of the amount she smoked (8:8).** **She couldn't cope with the 20mg patch (10:11)** **After not smoking for 48 hours she felt rough. Slow, tired unhappy and stressed (21:18-21; 22:2)**	**She was chewing a lot of gum to try not to smoke those 48 hours (21:15-16)**	**(26:14-21)**
SSPW21	**Between 10-20**	**She didn't manage to quit during her 2nd pregnancy and hadn't considered quitting since giving birth. But then her midwife asked if she'd like help with quitting at her booking appointment and she would never say no to that kid of help. Because she really want to quit (15:11-19).** **She not only wants to quit for her baby's health but for her own as well (16:1-2). She wants her children to see her around for a lot longer. And she always been quite an athletic person she wants to stay fit and healthy (16:4-7).** **Her daughter tells her "Mummy I don't want you to smoke" (16:22-24) and "Mommy you're going to get black teeth and smelly breath and all this horrible things, I don't what you to smoke (17:10-11). Her partner has given up for a week and her daughter loves that (17:6-9)** **She wants to set a good example for her children as well. She doesn't want them smoking when they're older (18:2-3)**	**She found trying to quit during this pregnancy more difficult compared to the last (1:11-12). She hasn't had any days where she's managed not to smoke as much (20:21-23)**			**She's not sure she has the willpower even though she wants to quit (1:15)** **She thinks she has a bit of an addictive personality (3:16-17)She enjoys some of the cigarettes she smokes like the first one of the day and after her tea (16:10-11)** **She's really struggling. Smoking has got a hold of her (17:15-16). She feels she doesn't want to smoke but she needs to (17:23-24)** **She smokes more if she's having a stressful day (19:6)** **She thinks she's doing well and at the end of the day she looks at how many she's smoked and she realises she hasn't done well. If anything she's smoked more (20:1-4). This stresses her out even more because she's yet failed to do what she wanted to do that day(20:6-7)** **She just can't go without one (20:13)** **She tends to smoke quite a few in the morning (21:5)** She says she has all the reasons and encouragement there: her daughter is telling her not to smoke and she's pregnant with her 3rd baby but for some reason she can't do it (22:3-9) Part of her still wants to smoke. As horrible as it is she still enjoys a cigarette(23:16-18) 99% of herself hates smoking and 1% still wants to smoke (23:19-21). Until she gets rid of that 1% she says she can only do so much (23:21-23)	**She doesn't smoke the full fag. She rips off the half and smokes it (19:7-8) and throws the half away (19:13-14)** **If she's dying for a cigarette she'll wait for five minutes and then five more minutes (19:19-21).** **To do that she either watches telly or her little boy keeps her occupied.** **Or she washes (20:17-20)** **She's tried buying ten packets but at night if she's got non left she'll go out and get some more (20:9-11)**	

SSPW23	**About 20 on average (4:15)**	**She hasn't really bothered trying to quit because she doesn't really want to do it (7:17-18).** **She was sort of thinking about it because she was feeling pretty rough at the early stages of the pregnancy. She felt sleepy and lethargic and she thought she'd give it a go. Also her auntie died of a smoking related disorder which made her think she should give it a go. (7:20-24:8:2-6). Also she hears about people dying and stuff and smoking is aging her skin and her teeth (8:13-16)** **Her doctor sort of put her off smoking because he saying the she needs to stop smoking because it is know fact that it blocks the arteries and that it's not good for the baby (9:19-23)** **She wants to decorate her house and smoking makes it smell (17:9-12).** **She get's out of breath too quickly (18:6-8)**	**She didn't really attempt (8:7). She never went to the services (9:17). She didn't try to quit even for a day (12:4-7). She hasn't cut down either (12:8-9)**		**If she's busy she won't smoke for a few hours. You lose track of time (23:11-17)**	**If she's stresses she smokes more, about 30 a day (4:15-16). She get's stressed quite badly and smoking keeps her stress levels down she finds (22:19-21)** **If people are smoking around her and she smells the smoke it makes her want to ask for a cigarette (6:11-12)** **She can't go really go about half an hour without a cigarette (8:7-8)** **She smoked during her other 2 pregnancies and she says you either stop or you don't. And she didn't have any problems with her children. They say that babies have low birth weight when you smoke but her children were pretty heavy (8:18-23). She wasn't really concerned about smoking during her 1st pregnancy either and that hasn't changed with her other pregnancies (9:10-15)** **She asked her doctor for patches and he told her that he'll give her a month before he prescribes them because he said he didn't really want to do that because it's like offering her a pack of fags. Even though she told him that she wouldn't be able to do it without the patches (9:24; 10:1-8). If she were given the patches she probably would have given it a go (27:5-6)** **There are patches in her partner's room but she hasn't bothered trying them (11:2-3). She'd rather have her own prescribed to her so that's she knows it's the right dosage since she's pregnant (11:8-14)** **She took what the doctor said on board but a couple of days later in went out the window (12:1-3)** **She hasn't tried to cut down because if she thinks that she has 10 fags and needs to make them last longer she'll smoke them faster (12:9-11) and she just ends up going back to the shop for some more (12:18-19)** **If she doesn't have a fag she feels like climbing walls (12:21-22). The cravings are bad (13:1-2).** **Her partner is very negative about her attempts and does not support her which makes her think "forget it I'll carry on doing it" (14:9-17).** **Because he has a negative attitude she smokes in front of him to do his head in (14:22-24)** **She doesn't want to quit and put weight on (17:15-23)** **She says that out of 10 people about 1 or 2 quit and then a few months later they do it again. So she say's there's no point (21:15-20)** **If she's having a drink she smokes a few more (23:4-5)** **She smokes out of boredom and because it's habit of doing something with her hands (23:7-8)**	**Sometimes she manages to do 3-4 a day by watching telly or something or by having half a fag (15:2-7)**	**She might go back to the doctor and ask for the patches and take it from there (27:15-18)**
SSPW29		**She says as a women pregnancy is the time when you thinks over and**	**She manages to quit at 5 weeks of pregnancy. She did herself with no NRT, no sort**	**She hasn't smoked for 6 months (8:19-20)**	**The opportunities to smoke are much less compared to previous years because of all the rules about where one can't and can smoke. That's made it easier (7:20-**	**There was that little voice at the back of her head going "You've been doing this for years what difference is it going to make? You're not**	**She told herself she wanted to see how long she could go without**	**She hopes to stays quit after the baby**

		above anything else that you should really quit because it's not just you there, there's a little life in there (9:12-15) She didn't want to smoke while pregnant (46:5-6) Her father died at 51 from a smoking related heart disease and she didn't want that to happen to her (30:16-24; 47:4-5) For the money (17:3-8; 29;14-15; 47:4-5)	of other support (30:6-10). She went to her doctor and told him she was having trouble quitting smoking and the next day she woke up and decided that she was going to try not to smoke that day (35:14-23). When she went to the nurse she was 5-6 days smoke-free.		23) Her friends and family supported her by telling her how well she's done (30:10-11) She woke up one day and decided not to pressure her self and see if she could not smoke for a day. And she did it 35:20-26). She says that making a choice of not smoking instead of feeling forced or feeling under pressure you feel empowered by saying no to the cigarette so you are more likely to stay stopped (52:9-13) Her midwife is quite happy and her community midwife has been checking in on her and telling her it's brilliant she'd still not smoking. And she says she's been lucky because her work colleagues have been very supportive. And her husband's delighted (37:9-16). She sent around an email at works saying the if she didn't smoke by a certain day she would buy cakes for everybody and one of her bosses said that if she managed that then he would buy the cakes (48:1-5). She appreciated the support and well done messages. In the early days of her attempt when she got craving and needed a fag one of the girls at work would tell her "no you don't no go sit down and I'll make you a cup of tea: (48:13-22). She has a good network of people around her which she thinks is the key thing which probably made a difference versus a lot of the occasions in the past when she'd tried to stop (62:1-4) The more the time passes that she hasn't smoked the more harder she'd finding it to remember what it was like to be a smoker. Being a non-smoker now feels completely natural (45:13-18) She says she was determined this time that she didn't want to smoke while pregnant even though she'd done it with her other pregnancies(46:4-6).She says that this time what made her more determined in part was that she turned 30 last year and got to a point where she suddenly thought that she had to stop fooling herself. She supposes she'd grown up a bit (46:9-19).She was already trying to stop at the end of last year and was actually doing all right but had f family crisis and stopped the attempt (46:20-26) The nurse at the services insisting she take the patches even though she was smoke-free for 5 days made her stubborn and made her think "sod you. I'm going to go away and keep doing this and I'm going to do it without patches on her own" (47:11-21). She was stubborn this time (50:6-7) The longer she managed to go the more successful she felt, the easier it got (47:4-6) She started realising how much money she had and not scraping her credit card to within an inch of its life at the end of the month trying to find money for cigarettes(49:1-9) She realises now how much better she feels and she also knows that she doesn't smell anymore and that this baby is growing and is healthy. All those things which she knew but weren't enough to make stop in the past now that she has stopped she realises that these are why she should stay stopped (50:11-20)	hurting anyone" There's this kind of constant monologue going on. And it's all of the justifications that you've ever had over the years and all the reasons why she'd always smoked. It makes her want to stick up 2 fingers to society and say "Bollocks this is up to me"(32:23-27; 33:1-4). She would get these mental dialogues of reasons why she could just go and have one if she wanted, and questioning why she was trying to quit (33:18-22). And this mental dialogue was constant (33:26). It would spike up more towards the times where she might have normally had a cigarette (34:2-5). For her it was always the psychological bit that was the problem (41:23-26) When you stopped smoking the feeling of wanting a cigarette which really does feel very physical like a clenching in the stomach and makes her feel very tense was much stronger (33:7-16) She says that like a lot of smokers the first one of the day is the most difficult not having (36:5-7) She's depressive and has been struggling with long-term depression on and off and something like smoking was a crutch she used and trying to get rid of it was a lot harder (42:1-8) In the early days of her quit attempt she had physical carvings (48:15-20) Her grandmother dies about 6-8 weeks ago and the day she found out she'd died her gut reaction was that she wanted a cigarette. And a week later at the funeral all the family smoked and they were in each other's company for two days with lots of emotion and everybody was smoking and she very nearly caved in (49:12-21)	having her morning cigarette and she found that the longer you can go between getting up and that first cigarette the easier it seems o get (36:9-11) Around week 3 of her attempt she sent an email around at work and told her colleagues that if she still wasn't smoking by pay day she would buy cakes for everyone (48:1-3) During the time of grandmother's death and funeral to resist smoking she kept thinking that she'd come this far and that she really shouldn't smoke (50:1-3) She's reached a point now where she says she would really detest herself if she ruined her quit attempt (51:14-15) She once bought a packet of 10 cigarettes and enjoyed the ones she smoked. But then she carried on without putting herself on a big guilt trip about it and without believing that just because she had one that means she's started smoking again (52:15-19) Her therapist has taught her some relaxation techniques so when stressed rather than her reaction being to want a cigarette she's able to do other things or deal with it in other ways (54:15-20)	comes (51:16-17) But since her grandmother died it's been a bit rocky psychologicall y for her so she's sort of thinking that she'll stay stopped while pregnant but when the baby comes she might let herself smoke again (51:20-25)

					After the first week-10 days of her attempt smelling smoke made her feel really sick. She felt a bit nauseous during her pregnancy and the smoke made it worse. She thinks she ended up with a bit of a physical deterrent almost (51:3-12) She once bought a packet of 10 cigarettes and enjoyed the ones she smoked. But then she carried on without putting herself on a big guilt trip about it and without believing that just because she had one that means she's started smoking again (52:15-19) She's been in therapy and that has helped her be more mentally strong. She's more settles in herself and secure and able to manage how she feels about things. (54:12-13). Psychologically she's in a quite strong place (61:26)			
SSPW34	Max 20 but about 10 (5:7) or 15 (31:3)	Her fitness has gone down because she used to be quite fit. And the money side of things.(4:21-23; 5:1-2; 39:16)). She feels run down (39:18-19) She thought of the cost of smoking because of her situation being on her own with her son (6:4-6) Her son hates that she smokes (16:18-21) and tells her that it will kill her (17:1-7) She found out she was pregnant and thought she would stop it all (19:9-10) for the baby's sake (27:12). She want to quit for her son as well but mainly because she's pregnant (27:12-14) because it's affecting someone else (29:11-12)	She'd quit at the beginning of this pregnancy (3:7-8).As soon as she found out she was pregnant she tried quitting (30:18). When she found out she was pregnant she got the lozenges but kept on having the odd cigarette (19:9-15). She quit completely at first (31:1). That lasted about 2-3 weeks (31:6)	She smoking heavily at the moment (35:20)	At the beginning of this pregnancy she was happy so she was able to quit (27:18-19; 31:21) She found the lozenges helped in being quit for 2-3 weeks (31:7-11) She used to go round to her boyfriend's who's a non-smoker and hates smoking. So she found that helped (31:17-19). He didn't allow her to do it (34:15-18) She couldn't let her son see her either so she couldn't smoke while he was around (34:18-19)	Her dad died of a smoking related disease(3:15) but that was not enough to teach her (3:22)because she says she's not like her dad who smoke 50-60 a day(5:4-7). She tries to blank out the possibility of something like what happened to her father happening to her (5:13). Her brother who smokes a lot has also been diagnosed with what her father had but she always thinks it won't happen to her (5:15-17; 6:7) and that she doesn't smoke that much (6:8). She has much going in so she has other things on her mind (5:19-21). She's worried about putting on weight if she stops (8:20-21) She ran out of lozenges and couldn't get an appointment with the nurse. She begged the doctor for a prescription because it would take too long to get the appointment but he wouldn't . She was told that she had to see the same nurse and be monitored (18:1-22). So then she says she couldn't be bothered anymore (18:24-25). Some morning she's feeling positive and thinks she could do it if she had some lozenges (27:4-8) To get the appointments she's had to wait 3 weeks each time (25:9-10) and by that time her willpower had gone again (41:14-15) With her it's boredom as well and something to do with her hands (20:20) She doesn't have the willpower. Part of her wants to quit and other times she's thought that smoking is her only enjoyment (29:6-8) The fact that she smoked during her 1st pregnancy and her son is now fine has been her excuse about it and makes her thinks that she was able to do it once and get away with it. So that gives her hope (29:17-22; 30:1) The 2-3 weeks that she was smoke free not smoking was difficult because she would get angry and moody (32:6). She would get moody as she was craving (32:10-13). And she would die for a cigarette after meals (32:8) She would have an odd cigarette when her boyfriend wasn't around (33:21-22; 34:2-3)	At the beginning of this pregnancy when she was trying to quit she was constantly stuffing her face (9:13-15) Being occupied helped with the craving s(31:21)	She wants to go back to the services and try and quit (39:6). She doesn't have a goal at the moment because of everything (46:15)

						because she would be craving (34:9-10). She didn't have the willpower and she would just give in (34:12) Two weeks into her attempt something really bad happened so the first thing she did was turn to a pack of cigarettes (33:1-2). Her partner was not relaxed and supportive. If he were she thinks she would have smoked less (35:8-9). He was nasty about it and turned on her for it. The more he stressed her out and gone on about it the more she'd smoke (35:11-17) Her whole like at the moment is making it difficult not to smoke (31:22; 1-2). Loads of stuff happened last week which has made her smoke more (35:1-5). She and her partner split up and some days she feels she doesn't want the baby anymore (37:1-6). She can't quit at the moment. Her head is a mess (37:14-15) A lot of the time she feels it's too late in the pregnancy and she'd done what she's done (37:20-21). She thinks she's done the damage now because it's been 6 ½ months (38:6) She's worried about her finances and stresses about how she's going to cope which makes her smoke (42:22-24; 43:1-2)		
SSPW28	She used to smoke about 30 cigarettes (16:9)	She wants to quit to have a healthy baby. She says it's not fair that the baby is smoking and it's not the baby's choice to smoke (15:2-3) She also has health concerns(37:14) She wouldn't want her child to feel bad if she were to have a smoking related illness like her mother (18:21-22) By not smoking she'll have more money to spend (37:1-7)	She says that this attempt is proving a lot harder than in the past (14:20). She's cut down a hell of a lot (16:7) to about 5 cigarettes (16:9). She decided to quit as soon as she found out she was pregnant (17:8). She cut down gradually (27:8) and it took about 2-3 weeks (27:10)	She's currently smoking about 5 cigarettes a day (16:9)	When she's out she'd fine and she doesn't smoke (5:18-19). She doesn't smoke when out because she's embarrassed because people know she's pregnant and if they see her smoking they'll start saying things and that's going to make her stressed and angry (34:1-7) She recently found out that her other has a serious respiratory track problem and will die within 10 years if she doesn't quit smoking. This makes her try even harder to give up smoking because she doesn't want her child to go to feel like she's feeling now about her mum(18:19-22) She usually has her mum round and takes the cigarettes off her. She sometimes keeps her fags for her. She also has neighbours that help her by holding her fags for her (25:4-21) The people she socialises with doesn't smoke so when she's socialising she smokes less (29:10-21). She says it's easier in a group of people who doesn't smoke (30:1-2) She says with the smoking ban she can't smoke in pubs and bars so it's become easier not to smoke when socialising (30:4-6)	Stress and boredom makes her want to smoke (12:21) She's fining it hard because she's limited to what smoking aid she can actually have. Because she has morning sickness the gum makes her feel sick, the tablets gave her an allergic reaction, she can't use the patches because of her psoriases and the lozenges taste awful (15:9-21). She hasn't been given the inhalator yet (16:1-5) She worries about whether everything is ok with the baby making her attempt harder (16:19-21). Her next door neighbour is quite loud (16:22) which makes it harder because it annoys her and stresses her (17:2-3). There's load of stress going on which makes it hard for her (22:15-16). The baby's dada doesn't want to know about it and she's worrying about money (22:18-20) If she has cigarettes there then she smoked more (23:16-17) She usually needs cigarette in the evening because her next door neighbour is an alcoholic and screams and shouts every evening constantly. So she sits there and gets stressed, angry and worked up. So she needs a cigarette to calm down (26:5-21) Se says sometimes the stress drags her back (29:2) making her think that she needs a cigarette (29:4-5). It's her release. It helps her (32:9-15) People telling her that she shouldn't be smoking makes her want to do it even more because she's being told that she can't do it making her think	She doesn't smoke a whole cigarette. She souses it away half way through so as not to smoke the whole thing. She'll put it out and walks away and smoke the rest later (16:11-17) She just buys 10 cigarette every 2 days instead of buying 20 and having them there (23:15-16). So she's always thinking that she's got to have something for tomorrow because she'd not going to buy more until the day after tomorrow (23:20-21) She given her fags to some neighbours. She tells them to give then to here when the ones she has are gone and that she doesn't want them on the same day (24:4-21) She tends to go out a lot for walks and deliberately leaves her cigarettes at home as well as her money. So she cant smoke and can't buy more (25:7-13). Or she	She given up alcohol completely and she says that obviously the next step is to completely stop smoking (18:6-9). She wants to give up completely (27:21) but does not have a quit date (28:2)

						that they have nothing to do with her and can't tell her to do something (34:14-15; 35:3-7) Her mum smoked through 4 pregnancies and all of her children were fine. And she knows other people that have smoked all through their pregnancies and their kids have been fine. This plays on her mind. Also she has a friend who smoked through all her pregnancies except one and the one she didn't smoke with has loads of health problems (35:14-21; 36:13)	goes to see her sister-in-law who just had a baby and is a non-smoker and doesn't allow soke around that baby She'll spend the majority of the day with her (25:18-20) She's not setting a quit date because if it's too close it's scarier and if it's too far she thinks she'll relapse more (28:4-10). She's taking one day at a time (31:5) When her neighbour is stressing her out she sometimes goes out and doesn't come back until he's gone all quite (33:14)	
SSPW35	About 10 a day (4:21)	She decided to try and quit because she's pregnant and smoking reduced the oxygen getting to the baby (3:12-14). It's better for the baby to quit (13:12) She wants to quit for herself as well because it's healthier not to smoke (4:1-3) Because of the smell as well. She can't stand it even though she smoked. It's nice to keep fresh and healthy (4:5-10)	She's tried cutting down but it seems a little hard (3:14-15). She decided to try as soon as she found out she was pregnant (4:13-18), about 5 months ago (5:9).She cut down gradually (5:1-3). It took a couple of moths to get from 10 to 5 (5:5-6). She's never smoked less than 5. 5 is the least she smokes (11:11). She's finding it more difficult to cut down from 5 to none than it was to cit down from 10 to 5 (341:2)	She's cut down to about 5 day (5:1)	She has an ambition: she doesn't want her baby to be around smoke. She's determined and says that when there is a will there is a way (17:11-15). Thinking about a better lifestyle for her and her baby makes her determined (17:21)	She can go an hour or two and then she can feel herself craving. That's what she; finding hard the craving. And then she starts getting irritated and snappy (5:15-20; 6:1). So she thinks if she's around people she has to have one because she seems irritable and it's no nice for other people (6:3-4). When she tries not to smoke when craving she will reach a point where she feels like she's going to explode (7:2-3) She says it's difficult especially when she's around people that smoke and there's fags there and she's craving one. She just wants to go "Give us one" (11:2-8). She's ok if she's just had one but If she's gone for 2 ½ hours and then goes round someone who's smoking and she's craving she can't extend it any longer (12:14-20) When she's stressed out she seems to smoke more (11:14-18). She gets stressed because it's her first baby and she's trying to get everything together and some days she can be really calm and some day's she's thinking "oh my god I've got to get this and that" and then with the flat as well(11:21-22; 12:1-2). It can be stre4ssful when she starts letting things get on top of her (12:4-5). She says it's a scary experience because it's her first and she doesn't know what to expect (16:16-17). If she thinks about it too hard she ends up getting worked up (16:19-20) She says it's difficult just when she craves (13:5) She thinks it has a lot to do with boredom as well (29:21-22) She gets more craving from 12 onwards. Not in the mornings (31:11-13)	She has tried avoiding smoking as soon she gets a craving (6:20-22). She can probably last an extra hour and that's with her going up the wall (7:14-15) She's tried to resist buy not buying fags so that there are no fags around her (6:8-10). She's stayed away from people who smoke (7:14-15) She only smokes one when she needs one rather than just smoking while waiting around or something. And she tried to push it a little bit longer. Make the time go by a little bit longer. When she starts craving she leaves it and sees how far she can push before she starts getting irritable. That's how she's managed to cut down, by pushing herself a little bit (10:3-20) When she's around smokers she tells herself she doesn't need one yet (12:9)	She would like to stop smoking now that she has another 5 months left (3:17-18). She'd like to keep it up still quitting when the baby is born as well (13:13-14). She expect to have quit in 2-3 months at least (16:8)
SSPW33	Up to 15 a day (7:18)	She made the decision to try and quit because she was pregnant and in her head she shouldn't be smoking when she's			She felt guilty she was smoking the few she did so that's what her from saying know to her manager who knocked on her door to go have a cigarette. She didn't want to go back to smoking the amount that she did before (13:9-11). She felt guilty because she didn't	She says smoking is a habit. She'll have something to eat and within 10 minutes she'll have a cigarette. At work around 10.30-11 she'll have a coffee break and have a cigarette. She'll have dinner and then go for a cigarette.	She knew what times her manager would knock on her door to go for a cigarette and she would go round to another	

		pregnant. She says it's not good (8:8-10). She wouldn't have attempted to quit if she weren't pregnant t (9:16-18). A few days after she found out she was pregnant she had a scare because she was bleeding and had to go to the hospital and have a scan. So when she saw him she knew she had to sort it out (10:21-24; 1-7) Everyone was telling her that her smoking is going to go in her baby (10:15-19)			want her baby to be affected (13:14-16) and have breathing problems and asthma because of him (14:1-2) Her reception manager encouraged her to smoke so when she was with her it was easier not to go smoke (14:16-21) It got easier with time also because she was busy at work trying to wrap up everything before she left (16:16-18) Going out was ok because she wasn't drinking (18:12-13). With the ban inside pubs if she goes for a drink it's fine because she doesn't need to have a cigarette. If she's not with a group of people who smoke it doesn't bother her (18:15-18). When her sisters when out to smoke they didn't ask her as much (20:1-2) Her oldest sister always told her off for smoking (19:7-9) and if she was with her mum she would give her the evil eye (20:18-19). Her mum doesn't like her smoking so limitations like that helped (21:1) She can't smoke in her mum's house, her own house or at 2 of her sisters' houses so that stops smoking because if she were sitting down and was comfortable with her tea she didn't want t6o get up and go outside (21:2-21) Sometimes if she had a bad day at work one of her girl colleagues would get loads of chocolates and they would sit there eating and eating. Her colleague really disapproved because she's a trainee nurse. So she didn't want to get a lecture from her so it was easier just not to go for a cigarette. When this colleague was there, because she worked part time, it made it easier (23:3-11) She didn't want to be walking down the road 7 or 8 months pregnant smoking and people looking at her (23:18-22). She's scared of what other people are going to think (27:20-21) Her sister smoked during her pregnancy and her niece had breathing problems and asthma which the doctor said was because of smoking. She didn't want her baby to be the same (24:14-23; 25:1-8) Some days she was able not to smoke at all because she had more willpower (31:1-6) No that she's given birth she says it's easier because she's with the baby and won't leave inside to go out and smoke (33:20-24; 34:1-2)	Finishing work she'll have a cigarette as soon as she walks out. She says it's the routine of it..the time she usually has one (5:19-23; 6:1-3). That's what she found the hardest. Getting out of the habit of when she would have a cigarette (6:5-8), She also associated having coffee with having a cigarette (15:19-20) She has 6 sisters and 5 smoke although they don't live wither (7:9-10) so when they are at their mum's they all go for one together (7:12-13). So the temptation to join them was there (20:11-12) Because they would sit in the front garden chatting away to them so it was the social side of it (20:12-14) She wasn't told until about a month before she gave birth and she could have the patches or other stuff. She presumed she couldn't take any of that because she was pregnant (9:1-5) When she was trying to cut down one of her managers at work was constantly knocking on her door to go and have a cigarette and she'd have to say no that she can't (11:21-22; 12:1-2). She would be tempted to say yes and sometimes she did (12:13-18) When smoking at work she could discuss work and catch up on stuff. There was a gossip element to it as well. So if there were a lot happening at work she would be tempted to say yes to her manager (13:1-6) She found it difficult that she had to stop both drinking and smoking (13:17-19). Trying to stop both of them was really hard (13:23-24) On work days she would smoke more because work was really stressful because they didn't get a replacement for her. So if she had a stressful day she would smoke more (22|:7-10) Her midwife never mentioned smoking apart from the one time and although she received a call from the stop smoking services they never got back to her (25:11-23; 26:1-12). She thinks she didn't contact them herself because the woman who had phoned her came across as judgemental and that she disagreed completely that she was still smoking (27:4-12). She thinks maybe it would have a difference if she'd gone to the services (27:22-24; 28:1)	manager's office at that time and sit there for a bit. Because that manager encouraged her to stop and she knew that if she with her it would be easier to get caught up with work and not go smoke (14:10-22) To break the habit of wanting a cigarette she didn't have coffee (15:12) especially during coffee break time (16:5-6) She also didn't go out to get her lunch because then she'd have to have a cigarette on her way back. She would get lunch inside the hospital where she worked. And if she wanted something from out the other girls would go get her something (17:5-13) She kept away from certain people who smoked (17:18-24) She didn't go much out when she was pregnant (19:1-2) To avoid smoking with her sisters she didn't go out as much with them (20:17) She bought an inhaler (28:7-20) and used it when she felt like going for a cigarette (29:10) When trying to quit completely she tried not taking any cigarettes at work (30:2-4)	
SSPW24		She wants to quit because it's bad for the children because there's an unborn child inside her that's going to get affected (8:8-9). She doesn't want to harm the baby (13:2). She also wants to do it for herself because she's getting out of breath as she's getting bigger (13:2-4)		She quit for 3 ½ (3:16-17) but now she's been smoking for the past few days (14:12-13)	For the first 3 ½ moths of her pregnancy she couldn't smoke because she was being sick every time she smoked (3:16-17). At that time she didn't have any cravings for cigarettes (10:1-5). She stopped trying to smoke in the beginning because she was getting more sick from smoking (26:11-12) She says that as soon as she found out she was pregnant she cigarettes started tasting horrible to her. She doesn't know if it's all in her mind (10:15-17). Because she was 2-3 weeks pregnant before she found out and was still smoking (11:5-9) When she's got things going on around her she doesn't think about smoking (21:15-16)	She's read the information about what smoking can do to the baby. She knows all thin ins and outs but she says it just goes to the back of her mind (8:12-15). She doesn't really want to think about the problems smoking can cause when she's pregnant. She had to put it at the back of her mind because if she keeps on thinking about it she gets depressed and starts crying (9:3-9). She chooses not to think about it (9:12-13) She doesn't think about the money she wastes or about dying from cancer because she gets depressed (17:20-23) Even though smoking was making her sick she	Sometimes when she's depressed she tells herself to leave the cigarette there and that she can't have it (15:6-9) When she feels she needs a cigarette she thinks no because it can harm her (21-22) and be bad for her daughter (19:1) She eats to try not to smoke as much while pregnant (21:6-10)	

		She says smoking is getting expensive and she has a daughter to buy things for and another one on the way (16:15-18). Especially not having a job at the moment (16:20-21) Her daughter told her to stop (13:13). She said "Mummy I don't want you to smoke no more it's horrible" (13:19-21)				still tried to smoke a few times because she was used to having that cigarette in her hand and smoking it especially in college (23:13-15) because all the girls in her class smoked and she was the only one standing there. She says it's a follow fashion. She wanted to smoke because everyone was smoking. She felt left out (23:19-24; 24:2) She has a rat situation which made her want smoke. The other day she saw a dead rat and got stressed but was fine after she smoked (11:21-22; 12). And then smoking tasted lovely to her (12:12) Now if she smells a cigarette she wants one (12:20-21) She smokes more in the mornings. She doesn't smoke in the afternoons. She thinks it's because she's happy in the mornings and depressed in the evenings (14:16-20) When she's eaten loads of food that's when she wants a cigarette. And she eats more when she's happy (15:17-20). When her belly is full having a cigarette relaxes the stomach (15:19-22) When she's upset about things she feels she needs to have a cigarette (18:21) She sometimes forgets she's pregnant and just feels fat (15:11-13) She's never known anyone to have cancer from smoking and dying from smoking. If she had someone in her family or knew someone that had some problem because of smoking she'd kick it on the head straight away (20:5-9) When sitting home alone she wants a cigarette even more (21:13-14) Sometimes the smell of smoke when smokers smelt lovely and she would want a cigarette herself (25:8-10) When she's out she wants to smoke with her friends because she meets new people when she smokes because people smoke and talk asking for lighters (28:15-17)	She takes the dog for a walk to try and get smoking off her mind (21:12-13). Or she plaits her daughter's hair which takes an hour and forgets about cigarettes (39:17-19). Or she cooks some food (39:19-20) At college she just kept herself in the canteen and ate things (24:20-22)	
SSPW22		Because of the baby. If it was for herself she wouldn't quit (19:17-18). But she has a baby growing inside her and that's why she doesn't want to smoke (19:21-22). She's smoking and that smoke is going down to the child. She says that's not very healthy (20:2-3)		She's smoking (4:22-23)	The smell of smoke in the morning made her heave and she would be sick. That made her think that the baby doesn't like it (20:13-21) and was trying to tell her "Stop smoking" (21:1-2) When she had her first scan she realised she was giving a baby and she cried because she though she was killing it (22:15; 23:5) She hasn't got it in her to quit. She says she's not strong enough yet (19:18-19) . But because she's doing it for someone else and not herself(16-17) she's more determined for the baby's sake (36:2-3) and she know that baby could come out and have bad breathing problems and that would be her fault (27:4-8) She cut down gradually so she didn't find doing it difficult (30:4-5)	In the beginning it hadn't really kicked in that she was pregnant so she was smoking (22:8-12) She's had a bad pregnancy. She's been in and out of hospital because she's been bleeding. And her mate was the same and had a miscarriage. So she started smoking again because she was scared that she would have a miscarriage too. So too calm her nerves down she was smoking more (21:7-21) She also hasn't got a lot of money for the child so she's stressing (28:22-23) which is why she smokes (29:4) If she has an argument with her partner because her hormones are all over the place and she's a feisty person and she goes head to head with him. That doesn't help. She smokes more (32:10-22). If she has an argument she ends up smoking (33:6)	She watched the clock because she didn't want to go over her daily limit. She had to make sure she was having them at certain times (30:6-16) If she wanted to have more than her daily limited she'd have 2s but leave that 2s in her ashtray for tomorrow and then knock that 2;s off the next day's fags (31:3-4). She punished herself the next day (31:17-18) She'd try not to smoke extra fags until just	

						Going out is difficult because she gets stressed for wanting the toilet always (34:1-5) and it makes her want a fag (*34:15) **Most of her friends smoke (10:21) and if she's out she'll have a couple of drags but don't really add those to her allowance (34:18-22)**	**before she went to bed and if she couldn't handle it she'd smoke that half a fag (32:1-2)** **She ate to keep herself occupied (32:7)**	

Appendix for Chapter 6

Appendix 6.1: Publication

Mantzari *et al. BMC Health Services Research* 2012, **12**:301
http://www.biomedcentral.com/1472-6963/12/301

BMC Health Services Research

STUDY PROTOCOL Open Access

Using financial incentives to increase initial uptake and completion of HPV vaccinations: protocol for a randomised controlled trial

Eleni Mantzari, Florian Vogt and Theresa M Marteau*

Abstract

Background: HPV vaccination reduces the risk of cervical cancer. Uptake however, of the 'catch-up' campaign in England for 17-18 year old girls is below the 80% NHS target. The aim of this randomized controlled trial is to assess the impact of financial incentives on (a) the uptake and completion of an HPV vaccination programme and (b) the quality of the decisions to undertake the vaccination.

Method/Design: One thousand (n = 1000) 16-18 year-old girls will be invited to participate in an HPV vaccination programme: Five-hundred (n = 500) will have received a previous invitation to get vaccinated but will have failed to do so (previous non-attenders) and 500 will not have previously received an invitation (first-time invitees). Girls will be randomly selected from eligible participants who are registered with a GP in areas covered by the Birmingham East and North (BEN) and Heart of Birmingham Primary Care Trusts. The two samples of girls will be randomised to receive either a standard vaccination invitation letter or an invitation letter including the offer of vouchers worth £45 for receiving three vaccinations. Girls will also complete a questionnaire to assess the quality of their decisions to be vaccinated. The primary outcome will be uptake of the 1st and 3rd vaccinations. The secondary outcome will be the quality of the decisions to undertake the vaccination, measured by assessing attitudes towards and knowledge of the HPV vaccination.

Discussion: The key results will be: a) the effectiveness of financial incentives in increasing uptake of the 1st and 3rd vaccinations; b) the role of participants' socio-economic status in the moderation of the impact of incentives on uptake; and c) the impact of incentives on the quality of decisions to undertake the HPV vaccinations.

Keywords: HPV, Human papilloma virus, HPV vaccinations, Financial incentives, Vouchers

Background

Human Papillomavirus (HPV) is an ubiquitous sexually transmitted virus that could lead to cervical cancer [1,2]. HPV vaccines help prevent infection by some of the most common forms of HPV that are associated with later development of cancer [3,4]. The HPV immunisation process takes six elapsed months and is conducted in three stages: 1st vaccine, 2nd vaccine two months later, and a 3rd vaccine six months after the first vaccination. Completion of all three vaccinations is necessary to effectively reduce the risk of cervical cancer [5]. The degree of protection afforded by incomplete immunisation is currently unknown [6].

Since September 2008 a national programme has started in England and Wales aiming to vaccinate girls aged 12-13 against HPV. A two-year 'catch-up' campaign that offers the HPV vaccine to 17-18 year old girls has also been initiated. The objective of these HPV vaccination programmes is to provide three doses of the HPV vaccine to females before they become sexually active, when the risk of HPV infection and subsequent cervical cancer development increases. It is estimated that if this objective is met and vaccination coverage is sufficiently high (80% of the target population), up to 400 deaths per year in England could be prevented [7]. Although the national programme in England aimed at 12-13 year-old girls has resulted in high uptake (88.1%

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uptake of the first vaccination and 80.1% of the third vaccination), the uptake rates for the "catch-up" campaign in England (targeting 17-18 year olds) have been lower, with 62.2% of the target group receiving the first dose and 31.8% the third [7].

Offering girls financial incentives to undergo the HPV vaccination could increase these uptake rates. Incentive mechanisms are increasingly being considered and used in health care policy in the UK and elsewhere in an attempt to change health-related behaviour [8,9]. They are most effective in changing 'simple,' 'one-off behaviours' such as getting vaccinated [10-12]. Their effectiveness however, has been predicted to vary with recipients' level of social deprivation. Specifically, it has been argued that the most socially deprived should respond more to financial incentives [13]. Most of the calls, to use incentives in HPV vaccination programmes in the UK have so far focused on incentivising those providing the vaccination (e.g. GPs) rather than vaccination recipients [14]. Their effectiveness therefore in this context is currently unknown. Furthermore, no studies have assessed the role of social deprivation in the moderation of their impact on vaccination uptake.

Even if effective in improving uptake of the HPV national vaccination programme, the use of financial incentives raises concerns about the possible adverse effects they may have on the quality of people's decisions to engage in incentivised behaviours. For example, it has been argued that the prospect of receiving a financial reward could result in the risks associated with a particular health behaviour being overlooked [15].To date, however, no known studies have assessed the mechanisms by which financial incentives influence the decision-making processes involved in engaging in an incentivised health behaviour.

In summary, further research is needed to determine the impact of financial incentives upon first, uptake of the HPV vaccination, and second, the quality of recipients' decisions to get vaccinated. Furthermore, research is needed to determine the role of social deprivation in the moderation of the impact of financial incentives on uptake of vaccinations.

Objectives and hypotheses

The primary objectives of the present study are:

(a) To assess the impact of financial incentives on the initial uptake (uptake of the first vaccination) and completion rates (uptake of the third vaccination) of an HPV vaccination programme.
(b) To assess the impact of financial incentives on the quality of the decision to be vaccinated as measured by attitudes towards and knowledge of the vaccination.

The secondary objective is:

(a) To assess whether the impact of financial incentives on the initial uptake and completion rates of an HPV vaccination programme is moderated by participants' levels of social deprivation.

Hypothesis I

Those offered financial incentives to get vaccinated against HPV are more likely to receive the first and third HPV vaccinations.

Hypothesis II

The effect of incentives on uptake of the first and third vaccinations will be moderated by participants' levels of social deprivation, with larger effects of the incentives being observed for the most socially deprived.

Hypothesis III

Offering financial incentives reduces the quality of decisions to get vaccinated against HPV.

Methods/Design

Trial design

This is a randomised controlled trial in which two independent samples of participants are separately randomised to the offer of financial incentives for getting vaccinated.

Participants

Participants will compromise of 16-18 year old girls, living in Birmingham. To be included in the trial, girls must fulfill the following inclusion criteria:

(a) Live in areas falling under the administration of the Birmingham East and North (BEN) and the Heart of Birmingham Primary Care Trusts
(b) Be registered with a GP within one of the two PCTs
(c) Be eligible to be vaccinated through the clinics (Sutton Cottage, Partners in Health and Dove Medical Centre)
(d) Not have been vaccinated against HPV before.

Half of the sample will consist of girls who have previously received an invitation to get vaccinated, but have failed to attend the first appointment (previous non-attenders). The remaining half will consist of girls who have not yet received an invitation to attend the vaccination programme (first-time invitees).

Intervention

The components of the intervention used in the present HPV vaccination programme are:

Invitation letters

All participants will receive letters inviting them to attend their first HPV vaccination session. These will be sent on behalf of the Birmingham East and North and Heart of Birmingham Primary Care Trusts, and will include the date, time and location of the allocated appointments.

Reminder text messages

Participants attending their first vaccination appointment will be asked to inform the researchers of their mobile phone numbers. These will be used to send text messages reminding them of their subsequent vaccination appointments. These will be sent during the intervals between the first and second vaccinations and the second and third vaccinations and two days prior to the next session. An example of the wording of these messages is: *"(Name), don't forget your HPV jab today at (time) at the (venue). Thank you".*

Offer of financial incentives

Participants from the two samples (i.e. previous-non attenders and first-time invitees) allocated to the incentivised groups will receive a modified version of the standard vaccination invitation letter, described above, which will include the offer of vouchers worth £45 for receiving the three vaccinations. Specifically, participants will be informed that they will receive:

£20 for the first vaccination
£5 for the second vaccination
£20 for the third vaccination

Procedure

The trial will be run by the Birmingham East and North Primary Care Trust in collaboration with Healthy Incentives (www.healthyincentives.org.uk/, a social enterprise arising as a result of a partnership between the Young Foundation and the Birmingham East and North Primary Care Trust). The Birmingham East and North PCT has employed the Birmingham Primary Care Shared Services Agency (BPCSSA) to do the following: select participants to be included in the trial; randomise them to each group and post the invitation letters. Once the letters have been sent, the BPCSSA will provide the Healthy Incentives team with the details of all the participants who have been invited, including their names, addresses, scheduled vaccination dates, the participant group (previous non-attender or previously not invited) and randomisation group (incentive or not). The vaccinations for all individuals will take place at three community clinics. The BPCSSA will schedule a number of 'incentivised only' sessions at these clinics to avoid any tensions caused by not incentivising all groups. Vaccinations will be carried out by nurses working with Heart of Birmingham (HOB). When attending their first vaccination session and while waiting to get vaccinated, participants will be asked to sign a consent form and complete a measure assessing the quality of their decision to get vaccinated. They will also be requested to select a date for their next vaccination. Receipt of each vaccination will be contingent on completion of all the previous doses (i.e. in order to receive the 3rd vaccination participants will need to have first completed the 1st and 2nd vaccinations), with no skipping of doses being allowed. After receiving their vaccinations, participants in the incentivised groups will be provided with the appropriate shopping vouchers. Two days prior to their 2nd and 3rd vaccination sessions, the Healthy Incentives team will send participants text messages reminding them of their appointments.

Participant recruitment and randomisation

To be included in the study, participants will be selected randomly from a list of names of all girls aged 16-18 years, meeting the above inclusion criteria (See Figure 1). This list will be compiled by the Birmingham Primary Care Shared Services Agency (BPCSSA), which holds and controls all Birmingham patient data, from the names of all 16-18 year old girls eligible to be vaccinated against HPV. The list will be sorted according to whether girls have received a previous invitation to get vaccinated but have failed to attend their first session or have not previously received an invitation. BPCSSA will randomly select 500 participants to be included in the trial from each of these two sub-lists using the RAND() function in Excel. Selected individuals from both the samples will subsequently be separately randomised, via the aforementioned technique, to receive one of two invitations letters:

(a) A standard letter inviting them to attend their first vaccination session (Additional file 1) or
(b) A modified invitation letter, which will include the offer of vouchers worth £45 for receiving the three vaccinations (Additional file 1)

This will result in the groups presented in Table 1

Outcomes

Uptake

Uptake of each vaccination by participants will be recorded at the community clinics where vaccinations will take place.

Social deprivation

Levels of social deprivation will be measured by using participants' postcodes to calculate Index of Multiple

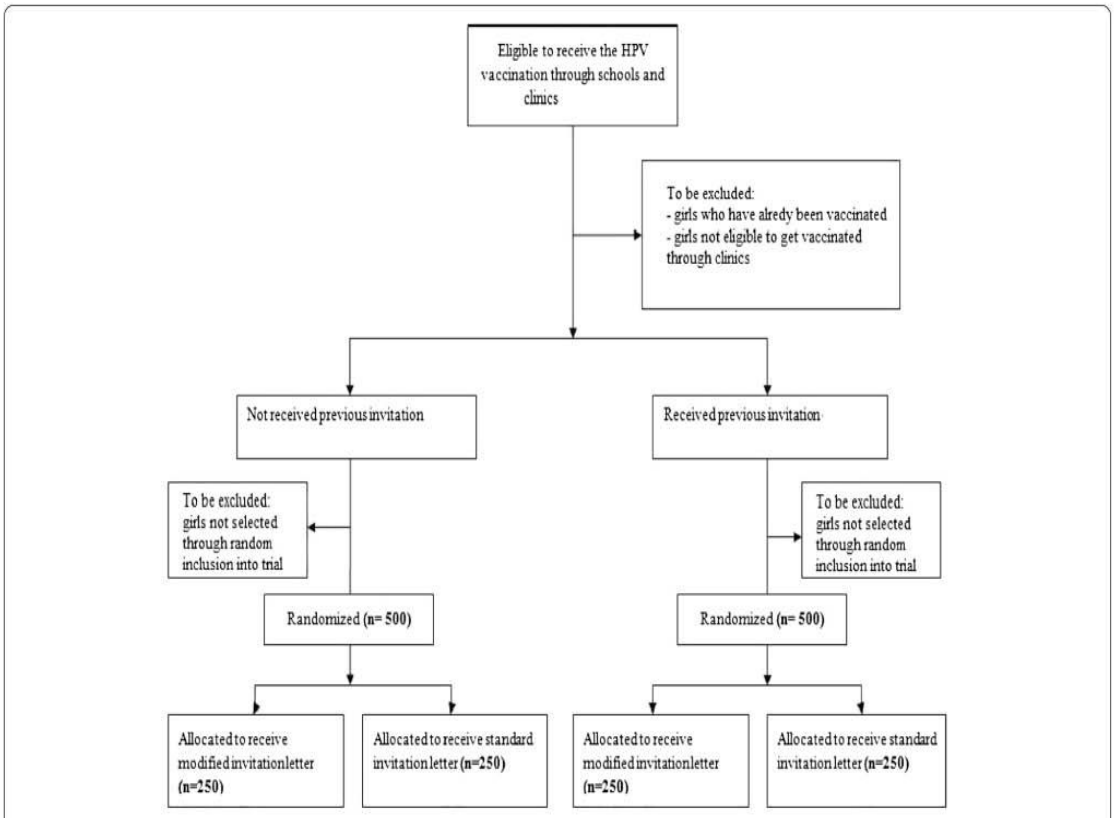

Figure 1 Recruitment and randomisation of participants.

Deprivation (IMD) scores. This is a measure of multiple deprivation measured at the small area level, i.e. the Lower Layer Super Output Area (LSOA). It is made up of seven LSOA level domain indices, which relate to income deprivation, employment deprivation, health deprivation and disability, education skills and training deprivation, barriers to housing and services, living environment deprivation, and crime. IMD scores range from 0 to100, with higher scores indicating higher levels of deprivation.

Informed choice

In order to assess whether the offer of financial incentives undermines the quality of decisions to undertake the HPV vaccinations, a short modified version of a validated measure of informed choice will be used [16]. This will consist of (Additional file 2):

1. Two items rated on a seven point scale, assessing attitudes towards the HPV vaccination: "For me, having the HPV vaccination is (a) 1: not at all good –7: extremely good and (b) 1: not at all harmful-7: extremely harmful."
2. Three items assessing knowledge of the HPV vaccination by requesting participants to determine the validity (whether true or false) of three statements relating to the vaccination: "If I have the HPV vaccination: I am less likely to get cervical cancer; I am less likely to get other sexually transmitted diseases; I am less likely to get pregnant."

Table 1 Incentivised and control groups

	Receiving invitation for 1st time	Having received an invitation previously
Control Group	250 (receiving standard invitation letters; no incentives)	250 (receiving standard invitation letters; no incentives)
Intervention Group	250 (receiving modified invitation letters; incentives)	250 (receiving modified invitation letters; incentives)

Sample size determination

According to the latest report from the Department of Health on coverage of the HPV vaccinations [7], the average completion rate for the "catch-up" campaign targeting females aged 17-18 years in the Birmingham East & North Primary Care Trust is 32.4%. Previous studies investigating the impact of financial incentives on uptake of vaccinations have reported an avergage between-group difference of approximately 8.5%: Specifically,

Moran et al. [17] reported an effect size of 8.5% for uptake of the influenza vaccination with incentives (20.3% (control group) vs 28.8% (incentivised group)) and Yokley et al. [18] reported an avergage increase of 8.4% in childhood immunisation across three time points with the addition of inventives (at two weeks: 10.1% (control group) vs. 22.5% (incentivised group); at 2 months: 22.7% (control group) vs. 30.8% (incentivised group); at three months: 26% (control group) vs 30.8% (incentivised group)). Based on these figures, we expect financial incentives in this study to increase completion (i.e. uptake of the 3rd vaccination) of the HPV vaccination programme by 8.5%, resulting in a completion rate of 40.9% by incentivised groups. To detect this difference between arms using a two-tailed χ^2 test at the 5% significane level with 80% power, a sample of 1008 participants is required (calculations performed in GPower 3.0); This figure has been rounded off to the nearest whole number, resulting in a required sample of 1000 participants (half of whom consist of previous-non attenders and half of whom, first-time invitees), giving 500 in each intervention arm (See Table 1).

Evaluation

The evaluation of the financial incentive scheme will be conducted by researchers at King's College London, Centre for the Study of Incentives in Health (CSI Health, www.kcl.ac.uk/csihealth). Data relating to participants' uptake of each of the three HPV vaccinations, along with their postcodes, age and answers to the measure of informed choice will be transferred by the Healthy Incentives team to CSI Health researchers. All information will be anonymised and kept securely. Data will be transferred via email in password protected files. CSI Health researchers will analyse the data with the aim of: i) determining the impact of financial incentives on uptake of the HPV vaccination and on the quality of girls' decisions to get vaccinated; and ii) writing up and publishing the findings.

Statistical analysis

To assess the impact of the intervention on initial uptake (i.e. the 1st vaccination) and completion of the HPV vaccination programme (i.e. the 3rd vaccination) logistic regressions will be performed separately for each of the two samples, i.e. for girls who have not received an invitation to get vaccinated before and those who have received a previous invitation but have failed to attend. To test the moderating effect of social deprivation on the impact of the intervention, the interaction between IMD scores and intervention will be added to the logistic regression models. To test whether there is a difference in the size of effect of the intervention in the two samples, datasets will be combined and another logistic regression conducted, in which whether participants have received an invitation to get vaccinated before or or not will be added as a predictor to the model, along with the intervention. To test for differences in the attrition rates between the 1st and 3rd vaccinations between the invervention and control groups the χ^2 test will be used. Finally, differences in knowledge of the HPV vaccination between intervention and control group will be tested using the χ^2 test, while differences in attitudes towards the HPV vaccination will be examined via a one-way analysis of variance. All tests will be assessed at the 5% level of significance.

Discussion

The results of the study will produce valuable information regarding the potential effectiveness of financial incentives in increasing uptake and completion of the HPV vaccinations by teenage girls. The results will also provide valuable information regarding the validity of concerns about the potentially adverse effects of financial incentives on the quality of people's decisions to engage in incentivised behaviours. If evidence from this trial supports such concerns, further research will be needed to assess how incentives might undermine informed choice, e.g. whether they alter who attends or whether they alter the attitudes towards and/or knowledge of the target behaviour in all who are offered incentives and therefore in those who attend. The design of the present trial does not allow for such assessments to be made.

Knowledge regarding the impact of financial incentives both on uptake of the HPV vaccination and on the quality of decisions to engage in incentivised behaviours is lacking in the literature. Findings therefore, are expected to clarify these issues and have the potential to inform discussions concerning the increasing use of financial incentives for health promotion.

Research governance

The trial is run by the Birmingham East and North Primary Care Trust, in partnership with the Young Foundation, as part of the former's service development. In consultation with the Trust, it was deemed that ethical approval was not required for its implementation. Ethical Approval was sought for researchers at King's College London, Centre for the Study of Incentives in Health, to access data from the Birmingham East and North Primary Care Trust in order to evaluate the financial incentives scheme. This was granted by the Birmingham East and North Research Ethics Committee (reference 11/WM/0073, 8th April 2011). NHS Permission for Research was granted by the Birmingham and the Black Country Comprehensive Local Research Network (BBC CLRN) Research Management & Governance (RM&G) Consortium

Office on behalf of the BBC CLRN RM&G Consortium Trusts (reference BENPC040.44791, 1st August 2011).

Trial registration

Current Controlled Trials, ISRCTN52339409.

Funding

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Additional files

Additional files 1: HPV Vaccination Invitation Letters.

Additional files 2: HPV Vaccination Survey Form.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

TMM advised on the research design. EM drafted the protocol. All authors provided input on the protocol and read and approved the manuscript.

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Appendix 6.2: HPV vaccination Invitation Letters

Control Groups

NHS Birmingham East and North

NHS Heart of Birmingham Teaching Primary Care Trust

MISS XXXXX XXXXX

ADDRESS LINE 1
ADDRESS LINE 2
ADDRESS LINE 3
POSTCODE

Immunisation Team
Newtown Health Centre
171 Melbourne Avenue
Newtown
Birmingham
B19 2JA

Wednesday, 27 November 2013

Tel: 0345-245-0777

Dear XXXXXX,

We are stamping down on cancer and inviting you to attend your first Human Papilloma Virus (HPV) vaccination. A leaflet about the vaccination is included and you can call us on the local rate number 0345-245-0777 if you would like further information.

This is being offered to all girls 12 – 18 years of age and provides protection from cervical cancer.

The vaccination will be held at:

Sutton Cottage Hospital
27a Birmingham Road
Sutton Coldfield
West Midlands
B72 1QH on **XX/XX/XXXX** at **XX:XX.**

If you need to arrange a different time or would prefer to attend a different clinic then please call the appointment line on the local rate number 0345-245-0777, Monday to Friday between 9am and 4pm.

Please do not contact the Health Centre directly to rearrange your appointment as they will not be able to help with this.

Yours sincerely
The Immunisation Team

Intervention Groups

NHS Birmingham East and North

NHS Heart of Birmingham Teaching Primary Care Trust

«PATIENT_TITLE»
«PATIENT_FORENAME»
«PATIENT_SURNAME»
«PATIENT_PREMISES»
«PATIENT_ADDRESS_STREET»
«PATIENT_ADDRESS_LOCALITY»
«PATIENT_ADDRESS_TOWN»
«PATIENT_ADDRESS_POST_CODE»

Immunisation Team
Safeguarding Offices
Gee Business Centre
Holborn Hill
Aston
Birmingham
B7 5JE

Tel: 0345-245-0777

Wednesday, 27 November 2013

Dear «Patient_Title» «PATIENT_SURNAME»,

We are writing to invite you to attend for your first Human Papilloma Virus (HPV) Vaccination.

This is being offered to all girls 12 – 18 years of age and provides protection from cervical cancer. You have been selected for a limited pilot incentive scheme where you will receive Love2Shop vouchers for receiving this vaccination. These can be redeemed at over 80 High Street stores. The vaccination is in 3 stages – you will receive £20 voucher for attending the 1st vaccination, £5 voucher for the 2nd and £20 for the 3rd.

Your appointment to receive the vaccination will be at:

Partners In Health
163 Yardley Green Road
Bordesley Green
Birmingham
B9 5PU on «Current_appointment_date» at «Current_appointment_time».

If you need to arrange a different time or would prefer to attend a different clinic then please call the appointment line on the local rate number 0345-245-0777, Monday to Friday between 9am and 4pm. Please note that in order to receive vouchers you must attend on the date specified above (or a revised mutually agreed date).

Please do not contact the Health Centre directly to rearrange your appointment as they will not be able to help with this.

A leaflet about the vaccination is included and you can call us on the local rate number 0345-245-0777 if you would like further information.

Yours sincerely
The Immunisation Team

Appendix 6.3: Community Clinics where HPV vaccinations took place

Vaccination sessions will be held at the following community clinics:

1. Sutton Cottage Hospital (Sutton Vessey)
27a Birmingham Road
Sutton Coldfield
West Midlands
B72 1QH

2. Dove Medical Centre (Erdington)
60 Dovedale Road
Erdington
Birmingham
B23 5DD

3. Partners in Health (Stechford)
163 Yardley Green Road
Bordesley Green
Birmingham
B9 5PU

Appendix 6.4: HPV Vaccination Survey Form

NHS Birmingham East and North

NHS Heart of Birmingham Teaching Primary Care Trust

HPV VACCINATION SURVEY FORM

Name: _____

Mobile Number: _____

To help us improve our service we are asking all those coming for HPV vaccinations to answer a few questions.

---

1. For me, having the HPV vaccination is (**please circle your answer**):
   1 2 3 4 5 6 7
   (1 = Not at all good; 7 = Extremely good)

---

2. For me, having the HPV vaccination is (**please circle your answer**):
   1 2 3 4 5 6 7
   (1 = Not at all harmful; 7 = Harmful)

---

3. Please state which of the following you think would be true or false if you have the HPV vaccination (**please tick as appropriate**):

	True	False	Don't
I am less likely to get cervical cancer			
I am less likely to get other sexually transmitted diseases			
I am less likely to get pregnant			

---

4. What is the main reason you came today to have the HPV vaccination (**please circle your answer**)?

a. Because I'm concerned about my health
b. Because my parents / guardian want me vaccinated

c. Because my friends are attending the HPV vaccination
d. Other reason – please specify

5. So we can increase the HPV vaccination take up rate we'd like to talk in detail to a small group of women about their experiences. These interviews would take place at home sometime over the next few months. They are entirely optional but will help us to improve our services. Would you be happy for us to call you about arranging an interview?

YES / NO:_____

6. We may share some of your protected health information with the third parties who perform services for us necessary to operate the incentive scheme. In those cases we have written agreements with the third parties that they will not use or disclose your information for any other purposes, except as required by law. Your confidentiality and privacy will be protected at all times and will be processed in accordance with the 1988 Data Protection Act. NHS Birmingham East and North will take all reasonably necessary steps to ensure your data is treated securely and confidentially. Additionally, text messages will be sent to you reminding you of your 2nd & 3rd vaccination dates. The information will also be used in writing a research report on how well the healthy incentives scheme helps increase the take up rate of the HPV vaccination – note that no one will be identified by name. We may contact you in the future regarding health related programmes or services. If you do not wish to participate in the scheme at any point, or require further information, you can contact us on 0345-245-0777. Are you happy to take part in the scheme?

Tick box if you agree to the Terms & Conditions ☐

Your signature: _____

Appendix for Chapter 8

Appendix 8.1: Recruitment email

Email title: Assessing the impact of Modagil (a new cognitive enhancing drug) on Memory – circular email

Circular email for use for recruitment of volunteers for study ref: 203/26.06.2012, approved by the LSE Research Ethics Committee. This project contributes to the College's role in conducting research, and teaching research methods. You are under no obligation to reply to this email, however, if you choose to, participation in this research is voluntary and you may withdraw at anytime.'

ARE YOU INTERESTED IN HELPING PROMOTE SCIENCE AND ENHANCING YOUR MEMORY AT THE SAME TIME?

If your answer is yes, then you might be interested in participating in a trial to assess the impact of a new drug, called Modagil, on memory.

Modagil is a central nervous stimulant that has been shown in human trials to be effective in increasing wakefulness. It is currently approved for the treatment of medical conditions that cause sleepiness. We are interested in determining whether it is also effective in improving the memory and focus in healthy, non-sleep deprived individuals.

What will be required of you?

1. **Completion of screening process**

In order to determine whether you are eligible to participate in the trial, you are first requested to undergo a screening process, which **involves completing an online questionnaire**.

During the screening process you will also be given more information about the trial and the drug Modagil.

To compensate for your time spent completing the questionnaire, you will receive an Amazon gift certificate worth £10.

Completing the screening process **does NOT** guarantee your participation in the trial. Undertaking the screening process **does NOT** mean that you have to participate in the trial.

To complete the screening process please click on the link:
http://www.atemmtrial-screening.co.nr//

2. Trial Participation

If you are selected for participation in the trial you will be requested to:

- Complete a one hour visit to one of our laboratories in central London
- Take a single dose of Modagil (200mg) (one pill)
- Complete a number of simple memory-related tasks

To complete the screening process and read more information about the trial please click on the link: http://www.atemmtrial-screening.co.nr/

For any further information please contact:

Eleni Mantzari
Health Psychology Section, Department of Psychology
King's College London, Guy's Campus
5th floor Bermondsey Wing, London SE1 9RT
Email: eleni.mantzari@kcl.ac.uk

Appendix 8.2: Study website -pages viewed by those offered £25 and allocated to the cognitive load task

Page 1

Welcome to the participant screening process for the ATEMM trial (Assessing the Effects of Modagil on Memory)

You are being asked to participate in the screening process aimed to identify individuals eligible to participate in the trial entitled: "Assessing the effects of Modagil on memory: the ATEMM trial"

Please read the following information carefully before you decide to participate in the eligibility screening process.

Aim of ATEMM trial

Modagil is a new analeptic drug (i.e. central nervous system stimulant) shown in human trials to be effective in increasing wakefulness. Although it has recently been approved only for the treatment of medical conditions that cause sleepiness, some findings suggest that it also has the potential to improve memory and focus in healthy, non-sleep deprived individuals.

The aim of the trial is to test the immediate impact of Modagil on non-sleep deprived individuals' performance on memory-related tasks.

What will be required of you?

1. Screening Process

WHAT DOES THE SCREENING PROCESS INVOLVE?

In order to determine whether you are eligible to participate in the trial, you are requested to undergo a screening process, which **involves completing an online questionnaire**.

The information you provide might be analysed by the research team for research purposes. It will be kept ***confidential*** and ***anonymous*** and will ***NOT be shared*** with third parties.

COMPENSATION

To compensate for your time spent completing the questionnaire, you will receive an Amazon gift certificate worth £10 via email (be sure to fill in your email address in the required field at the end of the screening process).

IMPORTANT

Completing the screening process **does NOT** guarantee your participation in the trial. It is possible that you **might not be selected** after completing the online questionnaire.

Undertaking the screening process **does NOT** mean that you have to participate in the trial.

At the end of the screening process you will have the option of stating whether or not you want participate in the trial. Whether you are actually selected to participate will depend on whether you are eligible.

2. Trial Participation

WHAT DOES THE TRIAL INVOLVE?

- A one hour visit to one of our laboratories in central London
- Taking a single dose of Modagil (200mg) (one pill)
- Completing a number of simple memory-related tasks

If you meet the eligibility criteria for participation in the trial, a member of the research team will contact you to arrange a date and time for you to come to one of our labs.

COMPENSATION

If you are selected to participate in the trial you will be **compensated for your travel expenses and will receive £25.**

Click here to continue

Modagil – Drug Information

Please take your time and read the following information carefully.

Click on the hyperlinks if you would like further information.

How does it work?

Modagil is a type of medicine known as a Central Nervous System (CNS) stimulant (i.e. it works by stimulating activity within the brain and spinal cord)

Modagil enhances wakefulness, alertness, mood and concentration and increases the capacity of working memory. Its effectiveness spans up to 8 hours.

The way in which Modagil improves wakefulness is not yet fully understood, but it is believed to have an effect on specific parts of the brain responsible for keeping us awake.

What is it used for (approved uses)?

- Relieving excessive daytime sleepiness due :

I. The sleep disorder narcolepsy

II. Shift work sleep disorder

III. Obstructive sleep apnoea

Some off-label (unapproved) uses

- Supressing the need for sleep
- Improving working memory after sleep deprivation
- Helping with jet-lag
- Disease and/or medication-related fatigue

Side effects

Medicines and their possible side effects can affect individual people in different ways. The following are some of the side effects that are known to be associated with this medicine.

Very common (affect more than 1 in 10 people)

- Headache
- Fast heart rate and awareness of your heart beat (palpitations)
- Dizziness

Common (affect between 1 in 10 and 1 in 100 people)

- Weakness or loss of strength (asthenia)
- Pins and needles sensations
- Nosebleeds

Uncommon (affect between 1 in 100 and 1 in 1000 people)

- Twitching or tremor
- Speech problems
- Memory loss
- Skin reactions such as rash or itching (see warning below)
- Psychiatric reactions (see warning below)

For detailed information on the possible side-effects click here

Warning!

If you get a rash during treatment with this medicine you should stop taking it and consult your doctor.

Psychiatric side effects, including depression and suicidal thoughts, have been reported in people taking this medicine. If you experience any distressing thoughts or feelings, particularly about suicide or harming yourself, at any point during treatment with this medicine it is important to stop taking it and talk to your doctor.

Dependence on this medicine may occur if it used for long periods of time.

Use with caution if you have

Liver problems

A history of mental health problems (depression, anxiety, mania, psychosis)

A history of substance abuse

Not to be used if you have

Irregular heartbeats (arrhythmias)

High blood pressure (hypertension)

Pregnant/Breastfeeding

Dosage

For adults the usual dosage is 200mg a day.

Interaction with other medications

Click here to read how this medicine interacts with other medicines

Click here to continue

Hyperlink 1

Narcolepsy

Narcolepsy is a sleep disorder that causes excessive sleepiness and frequent daytime sleep attacks. Narcolepsy is a nervous system disorder. The exact cause is unknown. It tends to run in families. Certain genes are linked to narcolepsy.

Symptoms

Narcolepsy symptoms usually first occur during ages 15 to 30.

The most common symptoms are:

- Periods of extreme drowsiness during the day. You may feel a strong urge to sleep, often followed by a short nap (sleep attack).
- Dream-like hallucinations between sleep and wakefulness. They involve seeing or hearing, and possibly other senses.
- Sleep paralysis. This is when you cannot move as you start falling asleep or when you first wake up. It may last up to 15 minutes.
- Cataplexy. This is a sudden loss of muscle tone while awake that makes you unable to move. Strong emotions, such as laughter or anger, can trigger this.

Treatment

There is no known cure for narcolepsy. The goal of treatment is to control symptoms.

Prognosis

Narcolepsy is lifelong (chronic) condition. It is not deadly, but it may be dangerous if episodes occur during driving, operating machinery, or similar activities.

Click here to go back

Hyperlink 2

Shift work sleep disorder

Shift work sleep disorder (SWSD) is a circadian rhythm sleep disorder characterised by insomnia and excessive sleepiness affecting people whose work hours are scheduled during the typical sleep period.

Causes and Symptoms

The primary symptoms of SWSD are insomnia and excessive sleepiness associated with working (and sleeping) at non-standard times. Total daily sleep time is usually shortened by several hours despite attempts to optimise the sleep environment. Sleepiness is manifest as a desire to nap, unintended dozing, impaired mental acuity, irritability, reduced performance, and accident proneness. Shift work is often combined with extended hours of duty, so fatigue can be a compounding factor. The symptoms coincide with the duration of shift work and usually remit with the adoption of a conventional sleep-wake schedule. The boundary between a 'normal response' to the rigors of shift work and a diagnosable disorder is not sharp.

Click here to go back

Hyperlink 3

Obstructive sleep apnea

Obstructive sleep apnea (OSA) or **obstructive sleep apnea syndrome** is the most common type of sleep apnea and is caused by obstruction of the upper airway. It is characterised by repetitive pauses in breathing during sleep, despite the effort to breathe, and is usually associated with a reduction in blood oxygen saturation. These pauses in breathing, called apneas (literally, "without breath"), typically last 20 to 40 seconds.

The individual with OSA is rarely aware of having difficulty breathing, even upon awakening. It is recognized as a problem by others witnessing the individual during episodes or is suspected because of its effects on the body OSA is commonly accompanied with snoring.

Signs and symptoms

Common signs of OSA include unexplained daytime sleepiness, restless sleep, and loud snoring (with periods of silence followed by gasps).

In adults, the most typical individual with OSA syndrome suffers from obesity, with particular heaviness at the face and neck. Obesity is not always present with OSA.

Common causes

Most cases of OSA are believed to be caused by:

- old age (natural or premature),
- brain injury (temporary or permanent),
- decreased muscle tone,
- increased soft tissue around the airway (sometimes due to obesity), and
- structural features that give rise to a narrowed airway.

Prognosis

Most patients find a combination of treatments which reduce apnea events and improve their overall health, energy, and well-being. Without treatment, the sleep deprivation and lack of oxygen caused by sleep apnea increases health risks such as cardiovascular disease, high blood pressure, stroke, diabetes, clinical depression, weight gain and obesity.

Treatment

There are a variety of treatments for OSA, including medication, surgical interventions and neurostimulation.

Click here to go back

Hyperlink 4

Modagil Side-effects Comprehensive information

Modagil has been evaluated for safety in over 2200 subjects, of whom more than 900 subjects with narcolepsy or narcolepsy/hypersomnia were given at least one dose of modagil. Modagil has been found to be generally well-tolerated. In controlled clinical trials, most adverse experiences were mild to moderate.

The most commonly observed adverse events (5%) associated with the use of modagil more frequently than placebo-treated patients in controlled US and foreign studies were headache, fast heart rate and dizziness.

In US placebo-controlled Phase 3 clinical trials, 5% of the 369 patients who received modagil discontinued due to an adverse experience. The most frequent (1%) reasons for discontinuation that occurred at a higher rate for modagil than placebo patients were headache (1%), nausea (1%), diziness (1%) and nervousness (1%). In foreign, controlled clinical trials, reasons for discontinuation were similar to those in US trials. In a Canadian clinical trial, a 35 year old obese narcoleptic male with a prior history of syncopal episodes experienced a 9-second episode of asystole after 27 days of modagil treatment (300 mg/day in divided doses).

Incidence in Controlled Trials: The Table presents the adverse experiences that occurred in narcolepsy patients at a rate of 1% or more and were more frequent in patients treated with modagil than in placebo patients in US placebo-controlled clinical trials.

The prescriber should be aware that the figures provided below cannot be used to predict the frequency of adverse experiences in the course of usual medical practice, where patient characteristics and other factors may differ from those occurring during clinical studies. Similarly, the cited frequencies cannot be directly compared with figures obtained from other clinical investigations involving different treatments, uses, or investigators. Review of these frequencies, however, provides prescribers with a basis to estimate the relative contribution of drug and non-drug factors to the incidence of adverse events in the population studied.

TABLE: Incidence of Treatment-Emergent Adverse Experiences in US 9-Week Placebo-Controlled Clinical Trials[1] with Modagil (200 mg and 400 mg) Daily

Body System	Preferred Term	Modagil (n = 369)	Placebo (n = 185)
Body as a Whole	Headache	50%	40%
	Numbness	4%	1%
	Dizziness	22%	0%
Digestive	Nausea	2%	1%
	Dry mouth	1%	0%
	Anorexia	1%	0%
	Abnormal liver function 2	1%	0%
	Mouth ulcer	1%	0%
Respiratory System	Nose bleeds	4%	3%
	Dyspnea	2%	1%
Nervous System	Depression	4%	3%
	Anxiety	4%	1%
	Dyskinesia3	2%	0%
	Asthenia	4%	0%
	Amnesia	1%	0%
	Emotional lability	1%	0%
	Ataxia	1%	0%
	Tremor	1%	0%
Cardiovascular	Palpitations	22%	1%
	Hypertension	2%	0%
	Arrhythmia	1%	0%
Metabolic/Nutritional	Hyperglycemia	1%	0%
Skin/Appendages	Rash	1%	0%
	Herpes simplex	1%	0%
	Dry skin	1%	0%
Urogenital	Abnormal urine	1%	0%
	Urinary retention	1%	0%

1. Events reported by at least 1% of patients treated with modagil that were more frequent than in the placebo group are included; incidence is rounded to the nearest 1%. The adverse experience terminology is coded using a standard modified COSTART Dictionary.
2. Elevated liver enzymes.
3. Oro-facial dyskinesias.

Dose Dependency of Adverse Events: In the US Phase 3 clinical trials, the only adverse experience that was more frequent (5% difference) in the modagil dose group of 400 mg/day than in the modagil dose group of 200 mg/day and placebo was headache.

Vital Sign Changes: There were no consistent effects or patterns of change in vital signs for patients treated with modagil enrolled in the US Phase 3 clinical trials.

Weight Changes: There were no clinically significant differences in body weight change in patients treated with modagil compared to placebo-treated patients.

Laboratory Changes: Clinical chemistry, hematology, and urinalysis parameters were monitored in US Phase 1, 2 and 3 studies. In these studies, mean plasma levels of gamma-glutamyl transferase (GGT) were found to be higher following administration of modagil, but not placebo. Few subjects (1%), however, had GGT elevations outside of the normal range. Shift to higher, but not clinically significantly abnormal, GGT values appeared to increase with time in the population treated with modagil in the 9-week US Phase 3 clinical trials. No differences were apparent in alkaline phosphatase, alanine aminotransferase, aspartate aminotransferase, total protein, albumin, or total bilirubin.

Although there were more abnormal eosinophil counts following modagil administration than placebo in US Phase 1 and 2 studies, the difference does not appear to be clinically significant. Observed shifts were from normal to high.

ECG Changes: No treatment-emergent pattern of ECG abnormalities was found in US Phase 1, 2, and 3 studies following administration of modagil.

Click here to go back

Hyperlink 5

Modagil- Interaction with other medication

This medicine may reduce the effectiveness of **oral contraceptive pills and patches.**

Antiepileptic medicines such as **carbamazepine** and **phenobarbital** may reduce the blood level of this medicine.

Modagil may increase the blood level of the antiepileptic medicine **phenytoin**, and people taking both these medicines should have their phenytoin levels monitored.

Modagil may decrease the blood level of the following medicines:

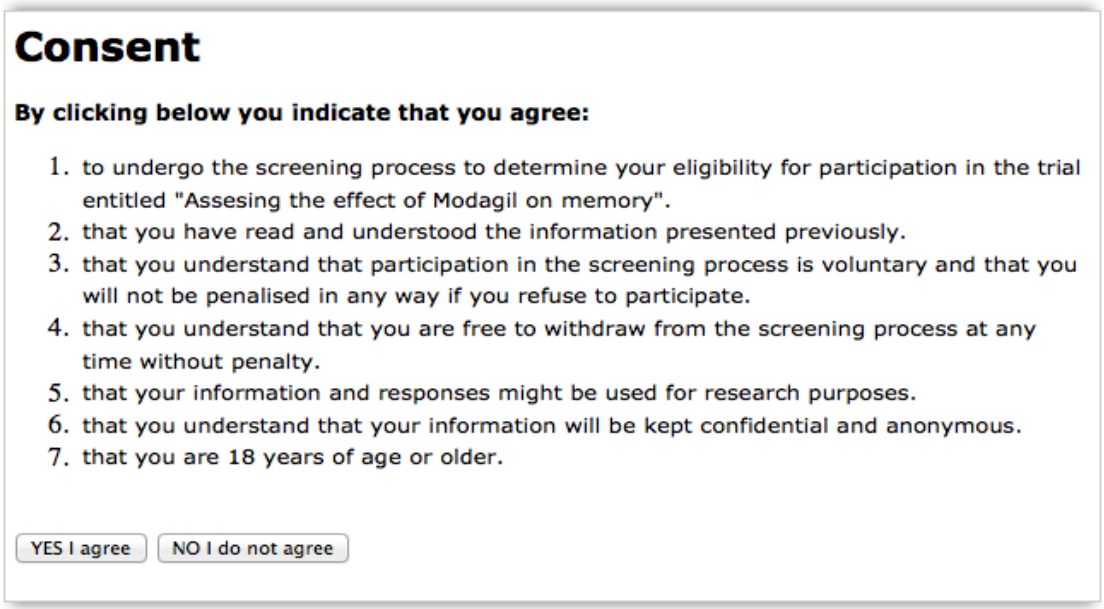
- buspirone
- calcium channel blockers
- ciclosporin
- midazolam
- protease inhibitors for HIV infection
- statins for lowering cholesterol
- triazolam.

Modagil may increase the blood levels of **antidepressant medicines** in a particular group of people known as 'poor metabolisers'. These people lack a particular enzyme (CYP2D6) that breaks down medicines in the body, and so may need a lower dose of antidepressant if also taking modagil.

The manufacturer of this medicine recommends that people who are taking the anti-blood-clotting medicine (anticoagulant) **warfarin** should have their blood clotting time monitored regularly during the first two months of treatment with this medicine and after any dose changes.

Click here to go back

Page 3



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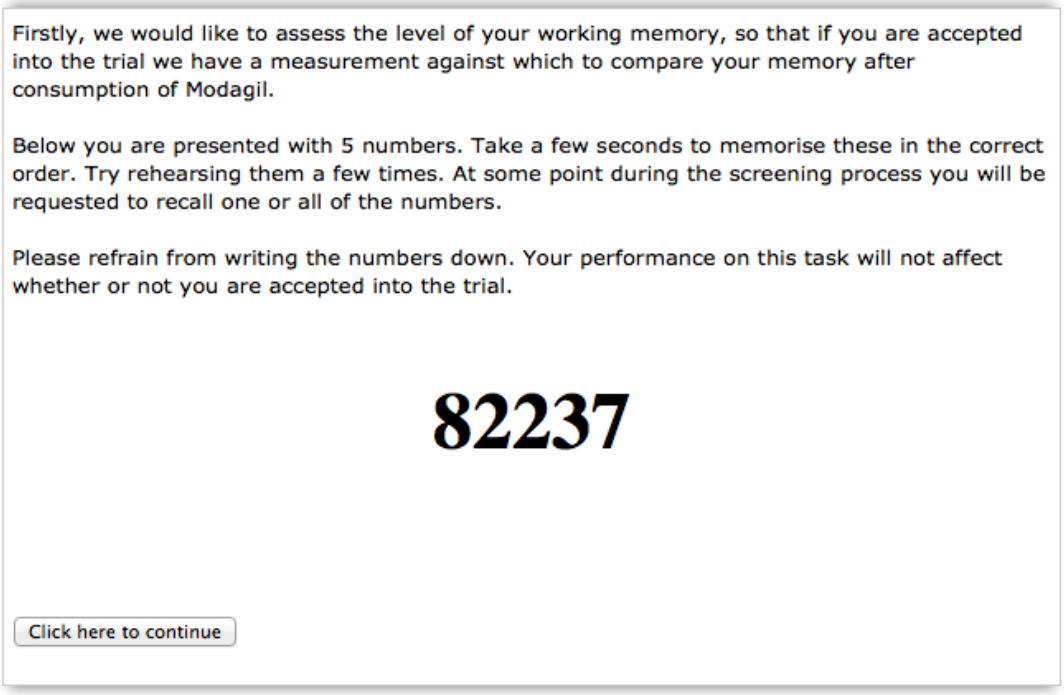

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Page 5

About you

Please select you gender

What is your age?

What is your ethnicity?

What is your occupation?

If selected "Other" above please specify

What is your highest educational qualification?

If selected "Other" above please specify

What is your relationship status?

Do you have any health-related problems?

If selected "Yes" above please specify:

Do you have any attention/memory/concentration problems?

If selected "Yes" above please specify:

Do you have any mental-health problems?

If selected "Yes" above please specify:

Do you have any learning difficulties/problems?

If selected "Yes" above please specify:

In order to determine whether as a person you are more present-oriented or future-oriented, please select which of the two hypothetical scenarios you would prefer:

- To receive £45 in three days
- To receive £70 in three months

Click here to continue

Page 6

We are interested in finding out a bit about whether or not you consider the trial risky.

Please tick the option that most strongly corresponds to your thoughts:

	Very likely	Likely	Neither likely nor unlikely	Unlikely	Very unlikely
What is the likelihood of you experiencing **ANY** of the pill's side-effects?	○	○	○	○	○
What is the likelihood of you experiencing **ALL** the pill's side-effects?	○	○	○	○	○
What is the likelihood that you will personally benefit from taking the pill?	○	○	○	○	○

	Very bad	Bad	Neither bad nor good	Good	Very good
If you experienced **ANY** of the pill's side-effects how bad would it be for you?	○	○	○	○	○
If you experienced **ALL** of the pill's side-effects how bad would it be for you?	○	○	○	○	○

How do you see yourself? Are you generally a person who is completely willing to take risks or do you try to avoid risks? Please tick a box

Completely **unwilling** to take risks										Completely **willing** to take risks
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Click here to continue

Page 7

Please enter the 3rd and 4th number of the five numbers you were requested to memorise at the beginning of the screening process

Click here to continue

Page 8

Before participating in the trial we would like to make sure that you understand the possible risks associated with taking Modagil.

You will **not be excluded** from participation in the trial based on your answers to the following questions, but you may be requested to read the relevant information again.

Please right down as many of Modagil's side-effects as you can remember. If possible, specify whether these are described as "very common", "common" or "uncommon".

Click here to continue

Page 9

Experiencing which of the following requires medical attention (choose the correct answers; there could be more than one):

- ☐ Skin rash
- ☐ Fast heartbeat
- ☐ Speech problems
- ☐ Psychiatric reactions
- ☐ Memory loss

For each condition please specify whether Modagil should be taken with caution or should not be taken at all:

	should be taken with caution	should not be taken at all
Pregnant and/or breastfeeding women	○	○
People with high blood pressure	○	○
People with liver problems	○	○
People with irregular heartbeats (arrhythmias)	○	○
People with a history of mental health problems	○	○
People with a history of substance abuse	○	○

Click here to continue

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The screening process is now complete.

Please tell us whether you are interested in participating in the trial assessing the impact of modagil on memory by choosing one of the following options:

- ○ Yes, definitely
- ○ Yes, probably, but would like to discuss further with research team
- ○ No, probably not, but would like to discuss further with research team
- ○ No, definitely not

Please enter your email address below to receive the £10 Amazon gift certificate

To find out whether you are eligible to participate in the trial or not click the continue button below

Click here to continue

Page 11

Important information regarding your participation

Now that you have completed the questionnaires, we would like to inform you that **they were NOT part of a screening process** aiming to identify eligible participants for a trial assessing the impact of Modagil on memory. **This trial is fictitious and so is the drug Modagil. You are still entitled to receive the £10 Amazon gift certificate.**

The aim of the **study you just participated in was to assess the impact of offering money for taking a pill on the way people process information related to the pill's side-effects.**

Some participants were offered compensation only of travel expenses for participation in the trial, while others were also offered a sum of money for taking part.

What were you were offered?

- ○ Travel expenses
- ○ Travel expenses plus £25
- ○ Travel expenses plus £100
- ○ Travel expenses plus £1000
- ○ I don't remember

The nature of our study required us to withhold this information prior to your participation. Please feel free to contact us if you have any questions or concerns you would like to discuss or if you'd rather your data were not used for the purposes of the above study.

Thank you.

Click here to continue

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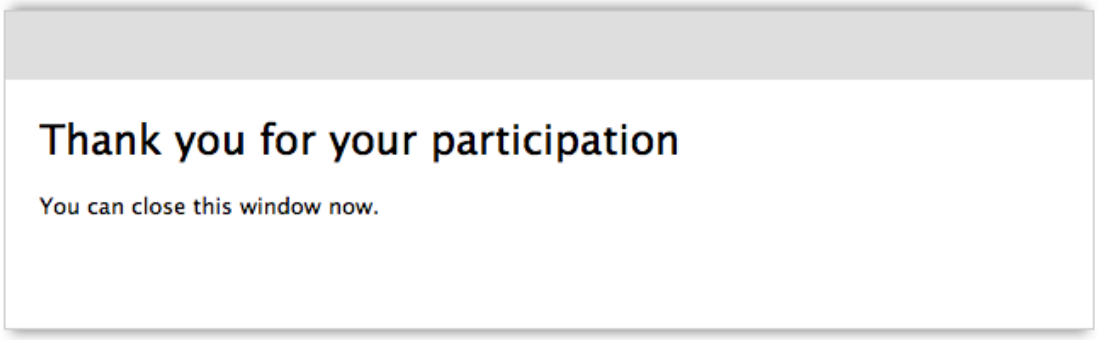


Appendix 8.3: Additional analyses confirming the robustness of findings relating to the time spent viewing the pill-related information

The distribution of the time-scores across the sample is positively skewed (S=10.69) and leptokurtic (K=145.13), as can be seen from Figure 1, with a mean of 106.11sec a mode of 53.6sec of and a median of 54.44sec (Table 1). Table 2 displays the cases with five highest and five lowest values. Casewise diagnostics identified four extreme outliers (i.e. cases with studentized residuals greater than 2) (Table 3).

Figure 1: Distribution of time-scores

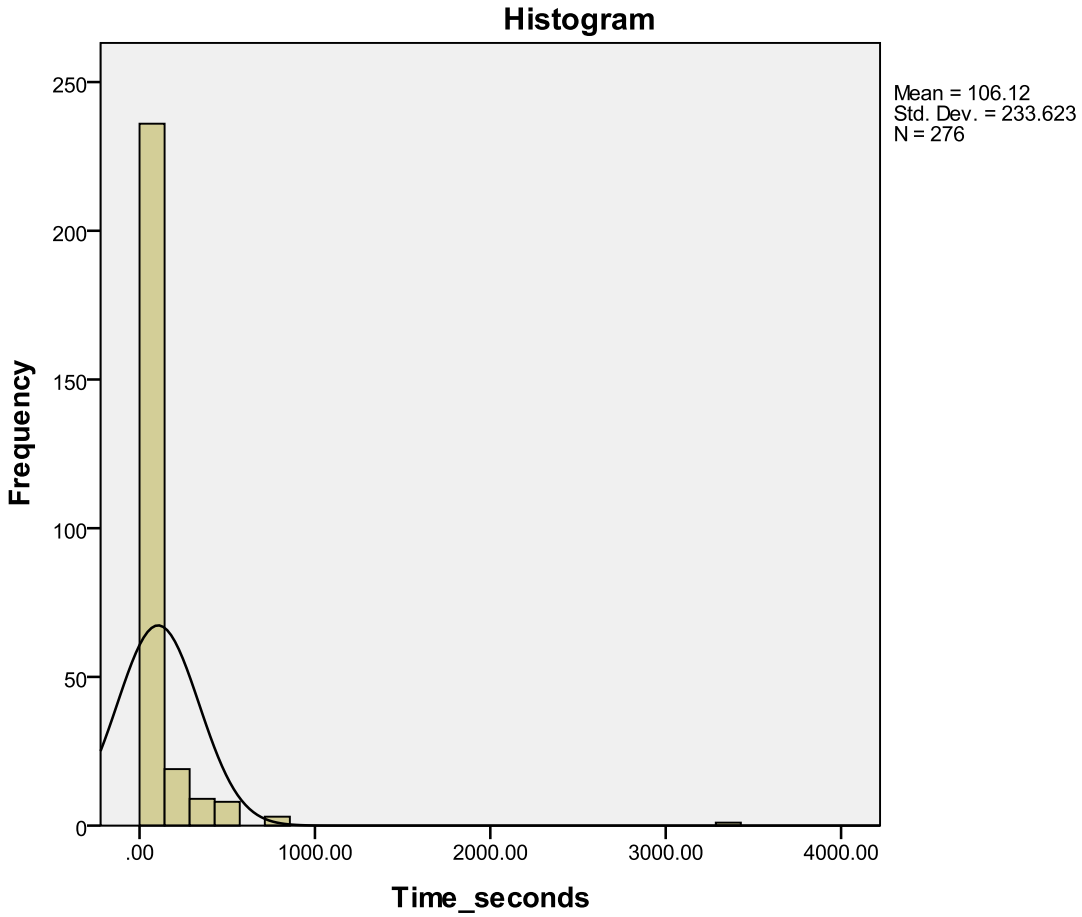


Table 1: Descriptives relating to the distribution of time-scores

Descriptives				
			Statistic	**Std. Error**
Time_seconds	Mean		106.1174	14.06244
	95% Confidence Interval for Mean	Lower Bound	78.4337	
		Upper Bound	133.8011	
	5% Trimmed Mean		76.2484	
	Median		54.4445	
	Variance		54579.608	
	Std. Deviation		233.62279	
	Minimum		1.37	
	Maximum		3401.60	
	Range		3400.23	
	Interquartile Range		63.34	
	Skewness		10.689	.147
	Kurtosis		145.131	.292

Table 2: The five highest and five lowest time-scores

			Case Number	Value
Time_seconds	Highest	1	216	3401.60
		2	214	833.25
		3	53	741.95
		4	215	734.23
		5	165	558.86
	Lowest	1	16	1.37
		2	13	2.20
		3	39	2.58
		4	137	2.73
		5	154	2.81

Table 3: Cases identified within the distribution of time-scores as extreme outliers

Case Number	Std. Residual	Time_seconds	Predicted Value	Residual
113	2.955	833.25	149.5905	683.65874
114	2.527	734.23	149.5905	584.63570
115	14.058	3401.60	149.5905	3252.00849
138	2.943	741.95	61.0401	680.90786

Taking into consideration the above and in order to assess the robustness of the findings relating to the impact of financial incentives and the moderating role of cognitive load on the time spent viewing the pill-related information presented in

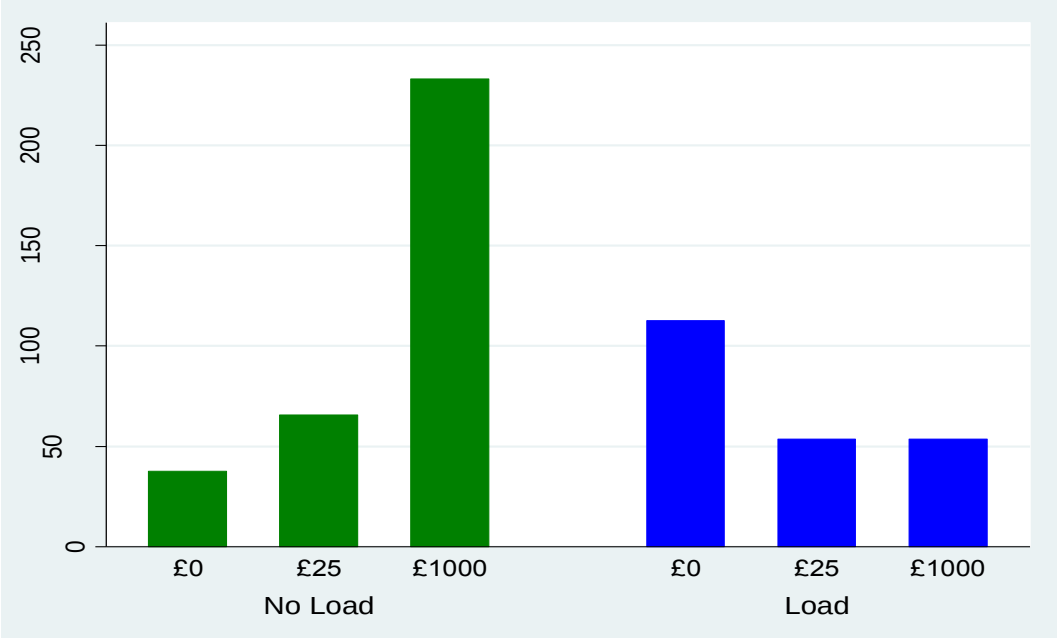
Chapter 8 two sets of additional analyses were conducted: a median (or quantile) regression, which is based on median values instead of means, and a robust regression, which places less weight on extreme and influential observations. Both of these additional analyses confirmed the findings of the initial analyses, which were based on log-transforming the data.

Specifically, as seen in Table 4, median regression revealed a significant effect of financial incentives on the median time spent viewing risk-information. This effect was moderated by cognitive-load. Pairwise comparisons using the median test revealed that under no load, participants offered £1000 for taking the pill spent longer time viewing the pill information (median=233.3 sec) compared both to those not offered incentives (median=37.5sec; $\chi^2(1, N=87)=21.3$ $p<0.001$) and those offered £25 (median=65.7sec; $\chi^2(1, N=85)=12.9$ $p<0.001$). Those offered £25 also spent more time viewing the information compared to those not offered incentives ($\chi^2(1, N=84)=17.2$ $p<0.001$). Under load, those offered both £1000 (median=53.6sec; $\chi^2(1, N=90)=21.4$ $p<0.001$) and £25 (median=53.6sec; $\chi^2(1, N=101)=18.6$ $p<0.001$) spent less time viewing the information compared to those not offered incentives (median=112.6sec). There was no significant difference between the two incentivised groups, ($\chi^2(1, N=105)=2.16$ $p>0.05$) (Figure 3).

Table 4: Median regression

Time_seconds	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Group	55.67	5.59346	9.95	0.000	44.65784	66.68216
Load	151.37	17.08744	8.86	0.000	117.729	185.011
Group*Load	-80.35	7.851539	-10.23	0.000	-95.80777	-64.89223
Constant	-33.78	12.14915	-2.78	0.006	-57.69871	-9.86129

Figure 3: Median time spent viewing risk- information: impact of incentive level and cognitive load



As seen in Table 5 robust regression also revealed a significant effect of financial incentives on the median time spent viewing risk-information. This effect was moderated by cognitive-load.

Table 5: Robust regression

Time_seconds	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Group	8.718498	3.988372	2.19	0.030	0.866235	16.57076
Load	74.45829	12.03273	6.19	0.000	50.76838	98.14819
Group*Load	-30.85021	5.563017	-5.55	0.000	-41.80262	-19.8978
Costant	32.1551	8.593861	3.74	0.000	15.2356	49.0746